IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BIGBAND NETWORKS, INC., Plaintiff, v. IMAGINE COMMUNICATIONS, INC., Defendant.	C.A. No. 07-351 (JJF) PUBLIC VERSION

DECLARATION OF KAREN JACOBS LOUDEN IN SUPPORT OF BIGBAND'S REPLY BRIEF IN SUPPORT OF ITS MOTION TO COMPEL FURTHER RESPONSES TO WRITTEN DISCOVERY

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May 30, 2008

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BIGBAND NETWORKS, INC., Plaintiff, v. IMAGINE COMMUNICATIONS, INC., Defendant.	C.A. No. 07-351 (JJF) PUBLIC VERSION

DECLARATION OF KAREN JACOBS LOUDEN IN SUPPORT OF BIGBAND'S REPLY BRIEF IN SUPPORT OF ITS MOTION TO COMPEL FURTHER RESPONSES TO WRITTEN DISCOVERY

I, Karen Jacobs Louden, hereby declare as follows:

1. I am a partner with the law firm of Morris, Nichols, Arsht & Tunnell LLP. I am one of the attorneys representing BigBand Networks, Inc. ("BigBand") in this litigation against Imagine Communications, Inc. ("Imagine").

2. Attached hereto as Exhibit 1 is a true and correct copy of a May 12, 2008 letter from J. Benassi to S. Graves.

3. Attached hereto as Exhibit 2 is a true and correct copy of a May 15, 2008 letter from J. Benassi to J. Blumenfeld and S. Graves.

4. Attached hereto as Exhibit 3 is a true and correct copy of a May 7, 2008 Imagine Press Release.

5. Attached hereto as Exhibit 4 are true and correct copies of Technical Glossary screen shots taken June 5, 2007.

6. Attached hereto as Exhibit 5 is a true and correct copy of a Technical Glossary screen shot taken May 14, 2008.

7. Attached hereto as Exhibit 6 is a true and correct copy of a March 2007 article by Fred Dawson entitled, "Powerful Processing Engines Promise Cable a Leap to Next-Gen at Low Cost."

8. Attached hereto as Exhibit 7 is a true and correct copy of an April 23, 2007 Imagine Press Release.

9. Attached hereto as Exhibit 8 is a true and correct copy of an April 30, 2007 Imagine Press Release.

10. Attached hereto as Exhibit 9 is a true and correct copy of a June 15, 2007 article entitled, "Imagine Communications claims 'jaw dropping' reaction for VOD statmuxing."

11. Attached hereto as Exhibit 10 is a true and correct copy of a July 1, 2007 white paper by Mark Tayer entitled, "Attack the HDTV Bandwidth Challenge with a Powerful Technology: VBR/StatMux for VOD and SDV."

12. Attached hereto as Exhibit 11 is a true and correct copy of a January 14, 2008 Imagine PowerPoint presentation.

13. Attached hereto as Exhibit 12 are true and correct copies of excerpts from Imagine brochures.

14. Attached hereto as Exhibit 13 is a true and correct copy of BigBand's Response to Imagine's First Set of Interrogatories, dated October 24, 2007.

I declare under penalty of perjury that the foregoing is true and correct, and that this declaration was executed on this 30th day of May, 2008.

Karen Jacobs Louden

Karen Jacobs Louden (#2881)

CERTIFICATE OF SERVICE

I, Karen Jacobs Louden, hereby certify that on May 30, 2008, I electronically filed the foregoing with the Clerk of the Court using CM/ECF, which will send notification of such filing(s) to the following:

Mary B. Matterer
MORRIS JAMES LLP

I also certify that copies were caused to be served on May 30, 2008 upon the following in the manner indicated:

BY HAND & EMAIL

Mary B. Matterer
Morris James LLP
500 Delaware Avenue
Suite 1500
Wilmington, DE 19899

BY EMAIL

John M. Benassi
Christopher Longman
Heller Ehrman LLP
4350 La Jolla Village Drive, 7th Floor
San Diego, CA 92122-1246

/s/ Karen Jacobs Louden
Karen Jacobs Louden

EXHIBIT 1

HellerEhrman LLP

May 12, 2008

Via Email Transmission and U.S. Mail

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Sara Petersen Graves
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Re: *BigBand Network, Inc. v. Imagine Communications, Inc.*
Case No. 07-351 (JJF) (D. Del.)

Dear Ms. Graves:

We are writing this letter in response to your earlier meet and confer letters and specifically your April 24, 2008 letter and subsequent motion to compel. We believe the motion was premature. It was filed before the meet and confer process was completed, and with all due respect, should be withdrawn so that a more orderly schedule for proceeding with this case can be entered into.

As discussed in various meet and confer sessions previously, your written discovery is directed to many products that are nonexistent. Had you completed the meet and confer process as contemplated by the federal and local rules you would have realized this. Likewise, if you or your client had availed itself of the opportunity to visit our premises and see exactly what technology we were working on prior to and subsequent to the filing of the action.

So it is pretty clear you have been guessing at what products we are actually producing, and your motion reflects that. This is particularly true with your motion to compel documents relating to Imagine's alleged Switched Digital Video Products. While Imagine has conducted research and development toward a prototype SDV staging processor, this is a recently-completed effort and is not a commercially available product. So not only is that product not on the market, but it does not use the technology claimed in BigBand's patents. It was also not called for by your written discovery. Additionally, while Imagine is currently investigating market demand for a QOD gateway capable of VBR Stat-muxing when interacting with a SDV staging processor that employs Imagine's technology, this is also not a commercial product. Again, Imagine is not currently developing that gateway and is only

evaluating the viability of doing so. These efforts were also not called for in your written discovery.

Indeed, it may come as a surprise to you, Imagine's only commercial product is the Imagine ICE Broadcast System employing Imagine's ICE and ICE-Q technology and that was not commercially available at the time you filed suit.

So, you are currently moving to compel documents that do not exist related to commercial products that do not exist.

Finally, legitimate meet and confer discussions did not really start until mid-April of this year, following months of hiatus where both sides stopped work on this case because settlement discussions were taking place in earnest. Even when the parties started revisiting and renegotiating discovery issues in mid-April, these efforts have been hampered further by the fact that both Peter Gratzinger left the firm and John Minton was no longer on the case.

So I recommend you withdraw the motion and continue our meet and confer process lest we waste valuable time with briefing and attending the hearing where we argue about issues that are non-existent.

We also recommend discussing a new discovery schedule to reflect the time we spent negotiating settlement rather than litigating since it is pretty clear we are not going to meet the August discovery cut-off date.

Please call us at your convenience to discuss how to resolve these issues.

Sincerely,

John M. Benassi
HELLER EHRMAN LLP

cc: Jack Blumenfeld, Esq.
Mary Matterer, Esq.

SD 904516 v1

EXHIBIT 2

HellerEhrman LLP

May 15, 2008

Via Email Transmission and U.S. Mail

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Sara Petersen Graves
Latham & Watkins LLP
140 Scott Drive
Menlo Park, California 94025

Re: *BigBand Network, Inc. v. Imagine Communications, Inc.*
Case No. 07-351 (JJF) (D. Del.)

Dear Counsel:

Following up on yesterday's phone call with Jack Blumenfeld, at which time we discussed the upcoming trade show, we enclose some materials which will be used at the show. We also address an issue which we believe has caused considerable confusion between the parties.

We believe it is important that you understand the difference between having a commercially available product, demonstrating a proof of concept model at a trade show to get potential customer feedback on the viability of developing the SDV gateway, and/or advance marketing of a product on Imagine's roadmap that we intend to release in the near future. To be clear, at the upcoming trade shows (NCTA next week; SCTE in June) Imagine will demonstrating three products of which only one is commercially available: (1) the Imagine ICE Broadcast System which is currently commercially available; (2) The ICE Gateway for VOD which is in development but won't be commercially available until 2009; and (3) Imagine staging processor for SDV which is Imagine's pre-processor for a SDV network and which is based on the same code and platform as the ICE Broadcast System. We are doing advanced marketing of this product as we intend to make it commercially available in Q3 2008.

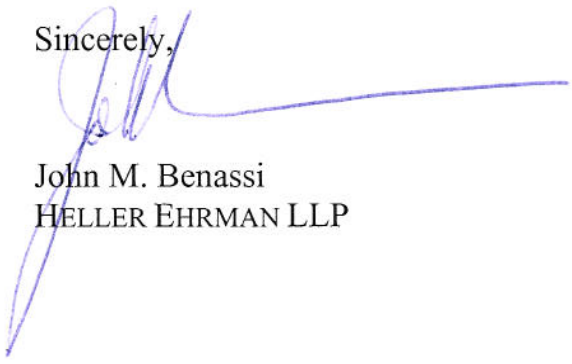
Imagine's marketing materials do mention that the same ICE Gateway we are developing for VOD can be used for implementing VBR multiplexing in an SDV architecture and we show network diagrams depicting this deployment scenario, on Imagine's web-site as well so this should not be surprising to anyone. But in order to enable the ICE Gateway to work in an SDV network we will still need considerable development work, which is not currently underway. So far Imagine has not received enough positive feedback, nor has it seen any demand for this product. Imagine does have a high level architecture and an SRS for the SDV Gateway (we have already produced up-to-date copies of these documents) which Imagine uses as part of Imagine's evaluation and planning process. If future customer inputs are supportive of developing and productizing the ICE Gateway for SDV for commercial deployment Imagine may do so in the future. But, please understand that this product is not currently commercially available, nor is it being developed at this time. So your client may see an ICE Gateway in Imagine's booth simulating the VOD application, but they will not see an operational SDV Gateway. The only SDV related product they will see is Imagine's pre-processor which Imagine calls its Core Staging Processor ("CSP") which is an extension of the ICE Broadcast System.

So, it appears that at least a portion of BigBand's motion to compel is based on a basic misconception of Imagine's commercial products, and seeks an order that Imagine produce extensive documentation on products with are not commercialized (and are at most concept products). As such, this portion of BigBand's motion is misplaced and should be withdrawn.

Yesterday you mentioned the possibility of the parties utilizing an independent IP expert to assist in settlement. I am not sure how far along we are in the process, but we agree with it, There is a basic misconception about Imagine's products which impeded prior settlement discussions.

Please call us at your convenience to discuss how to resolve these issues.

Sincerely,



John M. Benassi
HELLER EHRMAN LLP

Enclosure
cc: Mary Matterer, Esq.

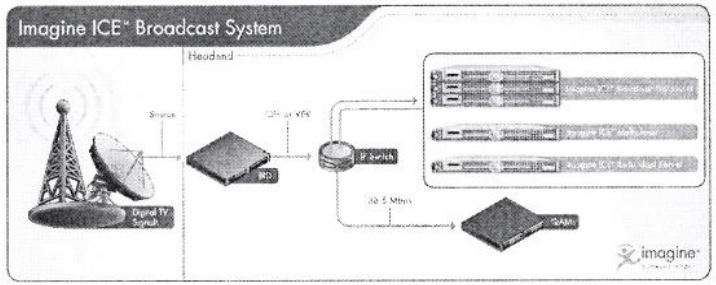
APPROVED

imagine a competitive advantage everyone can see

Area 1 (3:1 HD) A — Product Header

APPROVED

imagine delivering the highest quality HDTV



- Imagine ICE-Q™ algorithms ensure the best video quality at any given bit rate
- Video Layer QoS provides unprecedented control over video quality from source to set-top

Area 1 (3:1 HD) B — Product Feature Graphic

APPROVED

imagine™

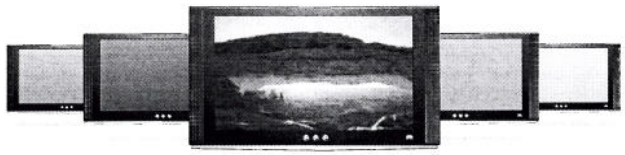
COMMUNICATIONS

Area 1 (3:1 HD) & Area 1 — Logo

APPROVED

imagine having it all.

MOST STREAMS. BEST QUALITY. CHOOSE BOTH.



imagine a competitive advantage everyone can see

- Video Layer QoS—the first platform enabling end-to-end control of video quality
- Imagine ICE-Q™ algorithms—the first accurate, objective video quality measurement subsystem

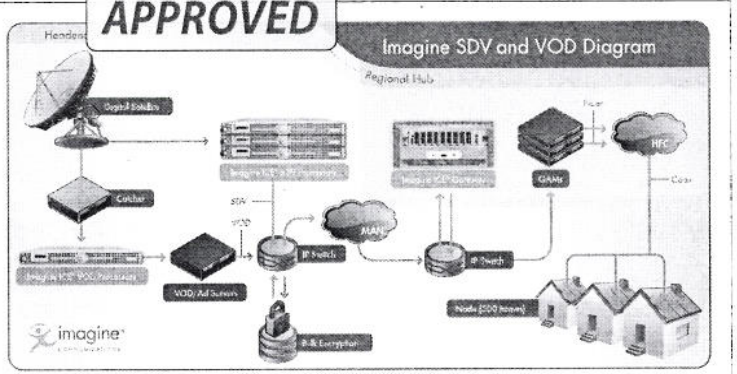
Area 1 – Above Seating Area – Option B

APPROVED

imagine up to 50% more streams at the best quality

Area 2 (1.5:1 SD) A — Product Header

APPROVED



- Delivers up to 15:1 SD signals over existing SDV, VOD and digital broadcast systems
- Provides the highest video quality at any given bit rate

Area 2 (1.5:1 SD) B — Product Feature Graphic

APPROVED

imagine having it all.

MOST STREAMS. BEST QUALITY. CHOOSE BOTH.

Video Layer QoS

The first platform enabling end-to-end control of video quality

Area 2A — Brand ID or Product ID Graphic

APPROVED

imagine having it all.

MOST STREAMS. BEST QUALITY. CHOOSE BOTH.

Imagine ICE-Q® algorithms

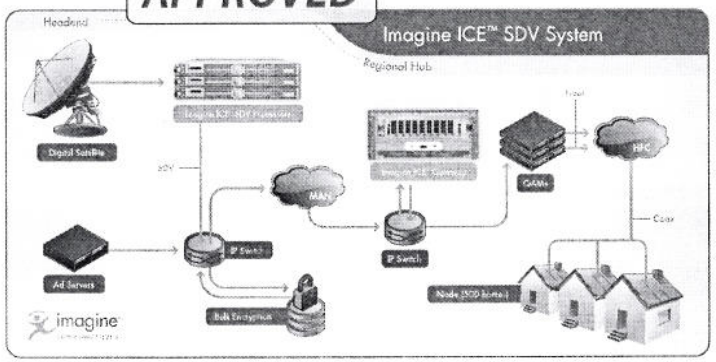
The first accurate, objective video quality measurement subsystem

Area 2B — Brand ID or Product ID Graphic

imagine instantly improving Switched Digital video quality

Area 3 (SDV) A — Product Header

APPROVED



- Offers dramatically higher CBR quality than conventional clamping
- Futureproof–Add Imagine ICE Gateway for end-to-end VBR StatMux

Area 3 (SDV) B — Product Feature Graphic

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imagine having it all.

MOST STREAMS. BEST QUALITY. CHOOSE BOTH.

Video Layer QoS

The first platform enabling end-to-end control of video quality

Area 3C — Brand ID or Product ID Graphic

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imagine having it all.

MOST STREAMS. BEST QUALITY. CHOOSE BOTH.

Imagine ICE-Q® algorithms

The first accurate, objective video quality measurement subsystem

Area 3D — Brand ID or Product ID Graphic

imagine total control of video quality
from the source to the set-top

Area 4 (sftwr mgmt) — Product Header

INTRODUCING
The Imagine ICE™ Video Manager

- Allows you to establish and sustain Video Layer QoS levels across services
- Measures and monitors the video quality of your network
- Provides detailed reports of video quality and service availability

Area 4 (sftwr mgmt) — Product Feature Graphic

EXHIBIT 3

imagine™
COMMUNICATIONS

For Immediate Release

Imagine to Demonstrate Superior Video Quality Across All Cable Digital Video Applications at The Cable Show '08

The ICE™ Video Platform, featuring ICE-Q® and Video Layer QoS Technologies, enables Industry's Highest Video Quality

Imagine's Ron Gutman to Present on Video Layer QoS, Monday, May 19

SAN DIEGO, Calif. – May 7, 2008 – Imagine Communications, the leading innovator in advanced digital video processing and multiplexing solutions, today announced plans to demonstrate its powerful ICE™ Video Platform across all cable digital video applications at The Cable Show '08, May 18–20 in New Orleans. In addition, Imagine's co-founder and CTO Ron Gutman will present his paper entitled "Video Layer Quality of Service (QoS): Unprecedented Control and the Best Video Quality at Any Given Bit Rate," during the session called "Bit Parts: New Approaches for Managing Video Encoding" on Monday, May 19, 10:45a.m.-12:00p.m. in room #211.

"We're excited to demonstrate how cable operators can deliver the highest video quality while still adding bandwidth-intensive content, such as HDTV and VOD, to their systems," stated Marc Tayer, Imagine's SVP of marketing and business development.

In booth #529 at The Cable Show, attendees will see how Imagine's ICE Video Platform, which leverages breakthrough video processing and multiplexing technology, can help cable operators deliver the highest video quality while cost-effectively increasing bandwidth efficiency across all digital platforms. Imagine's core technologies of Interchangeable Compressed Elements (ICE™) and video quality measurement (ICE-Q®) address the video quality needs of cable operators. ICE-Q is the industry's first accurate objective video quality measurement subsystem. It consists of algorithms built into Imagine's video processing solutions. By accurately emulating the human visual perceptual system, ICE-Q ensures the highest video quality at any given bit rate.

The following solutions will be demonstrated:

- The ICE Broadcast System, Imagine's initial product, offers the highest video quality and most efficient multiplexing of HDTV and SDTV broadcast channels, allowing cable operators to add dozens more linear HDTV signals at excellent video quality.

- The ICE VOD System allows operators to deliver up to 50 percent more VOD streams per 256 QAM channel, with enhanced video quality—providing the ideal platform for next-generation, consumer-controlled PersonalizedTV services.

- The ICE SDV System further enhances the inherent bandwidth efficiency of switched digital video, while dramatically improving the video quality of existing SDV networks.

- Video Layer Quality of Service (Video Layer QoS) offers an unprecedented level of control by allowing content providers and cable operators to pre-calibrate and establish video quality levels, at the video layer, which can be sustained from content origination all the way to the set-top box.

About Imagine Communications

Imagine Communications has launched the industry's most powerful and scalable digital video platform, enabling system operators to deliver the highest video quality and bandwidth efficiency for HDTV, Switched Digital, VOD and other advanced digital video services. The Imagine ICE™ Video Platform also provides Video Layer Quality of Service, offering system operators unprecedented control over video quality. Imagine is based in San Diego with R&D and engineering in Israel. Imagine's strong management team includes industry leaders with decades of experience delivering innovations in video communications. Founded in 2005, Imagine Communications is privately held and funded by Carmel Ventures, Columbia Capital and Court Square Ventures.
www.imaginecommunications.com

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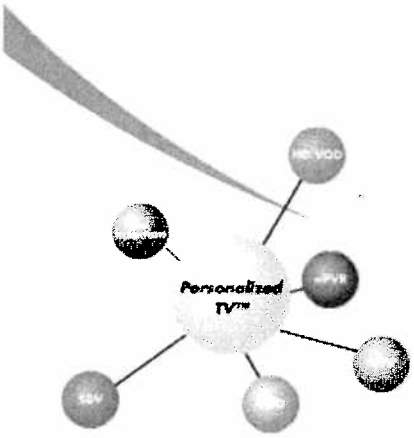
EXHIBIT 4

imagine COMMUNICATIONS

Enabling PersonalizedTV™



Technical Glossary

Ad Insertion - The process of placing an advertisement into a television program such that the transitions between the program and the ad (and vice versa) appear seamlessly to the subscriber. In the Digital Television area, Digital Program Insertion (DPI) is the basic method of ad insertion, and there are two important SCTE (Society of Cable Telecommunications Engineers) DPI standards, SCTE 30 and SCTE 35. While SCTE 35 standardizes cueing messages, SCTE 30 standardizes the communications protocol between the ad server and splicer. With targeted ads, or addressable advertising, advertisements can reach more specific audiences, based on demographic or other subscriber-specific profiles. The SCTE is developing additional standards in this area. Also, ad insertion into VOD programs is becoming increasingly important, using a "playlist" technique.

ADSL2+ - Asymmetric Digital Subscriber Line Two Plus. An advanced DSL technique which uses more line bandwidth than its ADSL predecessor, enabling up to 25 Mbps downstream speeds over short distances (less than 3000 feet from DSLAM).

AdvancedTCA (or MicroTCA) - An important new PICMG open specification and standard for carrier-grade communications equipment. The AdvancedTCA specification incorporates high-speed interconnect technologies, next generation processors, and improved reliability, manageability and serviceability. Imagine Communication's QOD Gateway utilizes AdvancedTCA hardware.

Bandwidth - A quantitative measurement of signal transmission spectrum, equal to the difference between the lower and upper frequencies of a frequency range. Hertz (Hz), or cycles per second, is the basic measurement unit of bandwidth (1 Megahertz, or 1 MHz, equals 1 million cycles per second). For example, the cable channel between 594 MHz and 600 MHz contains 6 MHz of bandwidth. (In contrast, transmission speeds (bit rates) are measure in bits per second (bps), or Megabits per second (Mbps)). Depending on the modulation and forward error correction techniques used, bandwidth also represents the information carrying capacity of a channel or frequency band. Video occupies much more bandwidth than audio or data, and HDTV video occupies roughly four times the bandwidth of SDTV video. Also, VOD utilizes tremendous bandwidth (vs. digital broadcasting), since every video streaming session occupies its own unique chunk of bandwidth.

Blu-ray Disc - A new HDTV optical disk format utilizing blue-violet lasers to read and write

data. A single layer Blu-ray disk can store 25 GB of data, while a double layer disk can store 50GB of data. The Blu-ray format is compatible with the MPEG-2, MPEG-4 AVC and VC-1 digital video coding standards, and handles resolutions up to 1920x1080.

CBR (Constant Bit Rate) - A method of digital video coding in which the bit rate stays the same over time. CBR coding is used in certain cases, such as VOD, SDV and IPTV, in which no viable VBR/StatMux solution has been available until Imagine's QOD Gateway solution. CBR is bandwidth inefficient and also constrains quality by "clamping" or "chopping off" the video peaks. Capped VBR, typically used in IPTV delivery systems, has the same drawbacks as CBR. With CBR, an arbitrary bit rate must be selected, which inevitably will be too high for simple scenes (and is therefore wasteful of bandwidth), and will be too low for detailed or complex scenes (and therefore compromises quality).

Consumer Generated StatMux - A 3rd generation statistical multiplexing system, developed by Imagine Communications, in which consumer demand of specific programs determines the flow of content through the subscriber access network. Consumer Generated StatMux applies to PersonalizedTV™ services such as VOD, SDV and IPTV.

Digital Television - A television delivery system in which video is digitized, compressed, and transported using digital transmission techniques such as modulation and forward error correction. Various other technologies are also typically incorporated such as service information, conditional access and encryption. SDTV and HDTV are two different categories of digital television involving different video resolutions. Digital Television is also defined as the viewing display or monitor device itself, along with associated electronics.

DOCSIS - Data Over Cable Service Interface Specification. The cable television standard for two-way communications with subscribers using Internet Protocol (IP) and QAM modulation. Initially used for high-speed Internet data access, DOCSIS is now also used for cable VoIP (Voice over Internet Protocol) and streaming video applications. The most recent DOCSIS spec, DOCSIS 3.0, uses channel bonding techniques to allow much higher downstream and upstream speeds.

DSL - Digital Subscriber Line. A general technology for transmitting data at high speeds over telecommunications carriers' copper wires. DSL typically uses Discrete Multi-Tone (DMT) modulation. With DSL, the transmission speed (bit rate per second) is highly dependent upon the distance of the home from the DSLAM. See ADSL2+ and VDSL2.

DSLAM - Digital Subscriber Line Access Multiplexer. A telecommunications carrier's infrastructure equipment which acts as the routing and multiplexing interface between the carrier's IP network and the individual access lines of its subscribers.

DVD - Digital Video Disk (or Digital Versatile Disk). An optical disk storage technique which uses red lasers to read and write data. DVDs use MPEG-2 compressed video at a Variable Bit Rate (VBR) for optimal storage efficiency and video quality. DVD disks can store up to 4.7 GB on a single layer disk or up to 8.5 GB on a dual layer disk. DVD supports resolutions up to 720 x 576 (i.e., SDTV, but not HDTV).

FTTH - Fiber To The Home. Sometimes used interchangeably with FTTP (Fiber To The Premises). An advanced high-speed triple-play network architecture in which fiber optic cable goes all the way to the subscriber's home.

GbE - Gigabit Ethernet, or GigE. A technology extending the use of Ethernet networking over

longer distances and at higher speeds. GbE allows transmission speeds up to 1 Gbps. 10GbE, the most recent and fastest of the Ethernet standards, allows speeds up to 10 Gbps. Cable operators use GbE extensively for transporting signals from headends to other headends and regional hubs over fiber optic cable.

HD-DVD - An HDTV optical disk format utilizing blue-violet laser technology to store up to 15GB on a single layer disk or 30GB on a double layer disk. HD-DVD is compatible with the MPEG-4 AVC, VC-1 and MPEG-2 video coding standards and handles resolutions up to 1920x1080.

HDTV - High Definition Television. A category of digital television in which the video resolution is up to 1920 horizontal pixels by 1080 vertical pixels using interlace scanning (1080i HDTV format), or 1280 horizontal pixels by 720 vertical pixels using progressive scanning (720P HDTV format). An HDTV signal typically occupies four times the bandwidth of an SDTV signal.

HD-VOD - High Definition Video On Demand. VOD in which HDTV content is digitally stored on network servers and delivered, upon request, in HDTV format to subscribers equipped with HDTV digital set-top boxes.

HFC - Hybrid Fiber Coax. Cable television architecture in which fiber is used to transport signals to local nodes, with coaxial cable utilized from the local nodes to individual homes. A local node typically comprises 500 to 2,000 homes.

ICEPAC™ - Interchangeable Compressed Elements with Personalized Adaptive Coding. Imagine Communications' core technology for digital video processing and multiplexing, incorporating a novel video analysis, quality measurement and indexing technique. The ICEPAC technology is used to facilitate Imagine's Consumer Generated StatMux solution as implemented in the QOD Gateway. ICEPAC can be applied to MPEG-2 or MPEG-4 AVC compressed bitstreams, and used for VOD, SDV or IPTV.

ICE-Q - Imagine's video quality measurement algorithms and subsystem.

IP - Internet Protocol. A packet-based network of networks, incorporating routing and control information, for delivery of digital information (data, email, files, web pages, music, video, voice, etc.) over wired or wireless networks. IP is a layer 3 (network layer) protocol, typically used in conjunction with TCP (Transmission Control Protocol), which is a layer 4 transport layer protocol (together, commonly referred to as TCP/IP).

IPTV - A type of digital television delivery system in which the digital video signals use IP transport all the way to the subscriber's set-top box. Typically associated with TelcoTV operators, cable operators can also provide IPTV over their DOCSIS pipes.

MAN - Metropolitan Area Network. A large communications and computer network spanning a geographic area. System operators use a MAN to interconnect various facilities and equipment distributed across a metropolitan area, such as headends and regional hubs. Fiber optics, IP and GbE are used extensively in MANs.

MPEG - Moving Picture Experts Group. A working group of the International Standards Organization (ISO) in charge of the development of standards for coded representation of digital video and audio.

MPEG-2 - An International Standards Organization (ISO) audiovisual coding standard used by most digital television service providers around the world. MPEG-2 is also used on DVDs. The MPEG-2 video coding standard is independent of the MPEG-2 systems and transport stream standards.

MPEG-4 - A family of International Standards Organization (ISO) audiovisual coding standards developed subsequently to the MPEG-2 standard. The most recent and most advanced MPEG-4 standard is MPEG-4 AVC (Advanced Video Coding), and is technically the same specification as the International Telecommunications Union (ITU) H.264 standard. MPEG-4 AVC digital video can be multiplexed within MPEG-2 transport and/or IP transport systems.

Network PVR (nPVR) - Network Personal Video Recorder. Instead of (or in addition to) a home-based PVR, a Network PVR stores digital television program files on network infrastructure servers. In one nPVR scenario, a digital subscriber can start a program from the beginning, even if he missed the start of the scheduled broadcast (but he may not be able to skip commercials). In another scenario, content is stored digitally in personalized network storage "lockers," with such storage based specifically on individual subscriber selection of particular programs.

NTSC - National Television System Committee. The U.S. standard analog television format incorporating composite color video, 525 lines of resolution, and interlace scanning of 60 fields per second. NTSC is also used in Canada, Japan and other parts of the world. NTSC also refers to the original U.S. committee which established the NTSC standard. While digital SDTV signals can be decoded and displayed on an NTSC television set, the same is not true of HDTV signals.

PAL - Phase Alternation by Line. An analog television standard used in many parts of Europe, Africa and South America. The PAL standard incorporates color video, 625 lines of resolution, and interlace scanning of 50 fields per second. Another analog television standard, SECAM (Sequential Color with Memory), also has 625 lines of resolution at 50 fields per second. Variations on SECAM are used in France, Eastern Europe, and parts of Africa. While digital SDTV signals can be decoded and displayed on PAL or SECAM television sets, the same is not true of HDTV signals.

PersonalizedTV™ - A digital television delivery system in which subscribers are able to access the content they want, when they want it. With PersonalizedTV, consumer demand determines the flow of content through the subscriber access network. VOD, SDV and IPTV are examples of PersonalizedTV services, as are targeted advertising and personalized audio.

PICMG - PCI Industrial Computer Manufacturers Group. A consortium of several hundred companies that develops open specifications for high-performance telecommunications and industrial computing applications. See AdvancedTCA.

QAM - Quadrature Amplitude Modulation. The modulation technique used for transmitting digital TV signals over cable television systems. QAM conveys digital information by continously changing the amplitude of two out-of-phase carrier waves. For nearly error-free transmission, QAM techniques are combined with powerful forward error correction algorithms. In a 256 QAM system, there are 8 bits per symbol, enabling 38.8 Mbps of information flow in a 6 MHz cable channel.

QOD™ Processor - Imagine's product which pre-processes VOD files, creating Interchangeable

Compressed Elements (ICE) and a related index which is used by the QOD Gateway to perform statistical multiplexing.

QOD™ Gateway - Quality On Demand Gateway. Imagine Communications' initial solution for the MPEG-2 VOD market, enabling many more simultaneous VOD streams per QAM channel and higher quality video. The QOD Gateway utilizes Imagine's software integrated with a powerful and scalable off-the-shelf AdvancedTCA hardware platform for packet processing and switching. Used in conjunction with the QOD Controller, management software, and Imagine's novel video analysis, quality measurement and indexing technique, the overall solution is called the QOD Gateway System.

QPSK - Quadrature Phase Shift Keying. A phase modulation technique with 4 states, typically used for transmitting digital TV signals via communications satellites to DBS (Direct Broadcast Satellite) subscribers or to cable or telco headends. QPSK modulation is combined with forward error correction techniques for nearly error-free transmission. With QPSK, 2 information bits per symbol are transmitted. Some satellite broadcasters have recently started using a more advanced technique called 8PSK (phase modulation with 8 states) for digital satellite television. Used in conjunction with turbo coding or Low Density Parity Coding (LDPC) techniques, the 3 bit per symbol capability of 8PSK enables much higher data rates through the same satellite transponder.

SDTV - Standard Definition Television. A category of digital television in which the resolution is up to 704 horizontal pixels by 480 vertical pixels (in NTSC countries such as the US) or 704 horizontal pixels by 576 vertical pixels (in PAL and SECAM countries).

Statistical Multiplexing (StatMux) - A bandwidth optimization technique in which digital television services sharing a common aggregate bitstream are deterministically allocated an instantaneous bit rate depending on the relative complexity of each service at any given time. With a StatMux system, each underlying individual bitstream is coded at a Variable Bit Rate (VBR). StatMux increases channel efficiency further beyond basic VBR since video complexity differs between the individual streams at any given time. In 1st Generation StatMux systems, the statmux function is tightly coupled with the encoder, enabling content providers to determine which digital services share the RF channel (e.g., satellite transponder or cable pass-through). With 2nd Generation StatMux systems, cable operators are able to demultiplex, re-package and re-statmux digital services for digital cable (QAM) transmission of digital broadcast signals. With Imagine's 3rd Generation StatMux solution, consumer demand determines the flow of content down the "last mile," hence Consumer Generated StatMux.

Switched Digital Video (SDV) - A relatively new digital TV delivery technology used by cable operators to increase bandwidth efficiency and allow carriage of more digital services. Instead of the traditional cable method of continuously broadcasting all content to all subscribers (regardless of whether any of them are watching), SDV only switches certain designated services down the local node if one or more subscribers sends a tuning message to the relevant SDV headend equipment. SDV typically uses multicast type techniques down the local node (i.e., as soon as one subscriber tunes into an SDV signal, additional subscribers in the same node can tune into the same video stream). Unicast type methods are also possible with SDV, in which a switched stream is unique per subscriber. Such unicast methods utilize more bandwidth, but offer certain advantages including more personalized service offerings such as targeted ads.

VBR (Variable Bit Rate) - A method of digital video coding in which the bit rate continuously changes over time. VBR is the optimal method of digital video coding as it represents the

natural "peaks and valleys" of digital video, with scene complexity continously changing over time. For example, a "talking head" on a news channel does not require many bits in order to digitally represent it with good video quality, so there is no reason to waste bandwidth by setting an arbitrarily high Constant Bit Rate (CBR). Conversely, an action sports event with a crowd in the background and a panning camera requires a high instantaneous bit rate for accurate representation, so it needs the "peak" capabilities of VBR to maintain good video quality. VBR allows the best video quality for any given average bit rate or storage capacity, and also ensures consistent video quality.

VC-1 - A SMPTE (Society of Motion Picture and Television Engineers) digital video coding standard which arose out of Microsoft's Windows Media 9 video technology.

VDSL2 - Very-high-bit-rate Digital Subscriber Line Two. VDSL2 is the most recent DSL standard being finalized by the International Telecommunication Union (ITU). With VDSL2, downstream transmission speeds of up to 50 Mbps can be achieved for short distances from the DSLAM (1000-2000 feet).

VOD - Video on Demand. A digital television technology and service in which video content is stored in headend servers, and subscribers can access such content whenever they want, including the ability to use "trick modes" such as Pause, Fast Forward and Fast Rewind. With VOD, every stream is unique to a subscriber viewing session. HD-VOD uses roughly four times the bandwidth (per stream) of standard definition VOD. Today's VOD systems use Constant Bit Rate (CBR) for SDTV (3.75 Mbps) and also for HDTV (roughly 14 Mbps). In both cases, migration to a VBR/StatMux system is critical as VOD service scales up to its mass market consumer potential.

EXHIBIT 5

imagine™ COMMUNICATIONS

SOLUTIONS

Imagine ICE Video Platform

- Imagine ICE Broadcast System
- Imagine ICE SDV System
- Imagine ICE VOD System

White Papers

Technical Glossary

TECHNICAL GLOSSARY

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z

ICE-Q®

Imagine's objective video quality measurement algorithms and subsystem, enabling better video quality at any given bit rate.

ICEPAC™

Interchangeable Compressed Elements with Personalized Adaptive Coding. Imagine Communications' core technology for digital video processing and multiplexing, incorporating a novel video analysis, quality measurement and indexing technique. The ICEPAC technology is used to facilitate Imagine's Consumer Generated StatMux solution as implemented in the ICE Gateway. ICEPAC can be applied to MPEG-2 or MPEG-4 AVC compressed bitstreams, and used for digital broadcast, VOD, SDV or IPTV.

ICE™ Broadcast System

Imagine's initial product for the digital broadcast market enabling system operators to carry up to 50% more HD and SD digital broadcast signals without sacrificing video quality. For the first time, system operators can broadcast 3 HDTV or 15 SDTV services within a 256 QAM channel. The ICE Broadcast System is fully compatible with MPEG-2 subscriber bases.

ICE™ Gateway

Imagine's headend or edge solution for the MPEG-2 VOD and SDV markets, enabling many more simultaneous streams per QAM channel and higher quality video. The ICE Gateway utilizes Imagine's software integrated with a powerful and scalable off-the-shelf MicroTCA hardware platform for statistical multiplexing.

EXHIBIT 6

Powerful Processing Engines Promise Cable a Leap to Next-Gen at Low Cost (March 2007)

RGB Expands Edge Product Suite with High-Capacity Universal Modulator as Imagine Communications Touts New Way to Achieve Bandwidth Efficiencies

By Fred Dawson

Recent network component innovations at the cutting edge of micro-processor technology have opened significant and potentially disruptive new paths for cable operators to consider as they weigh migration strategies.

As two important cases in point, the new modular products on offer from RGB Networks and Imagine Communications offer flexible frameworks that allow operators to greatly enhance network performance without requiring immense amounts of investment or alterations in physical infrastructure. These innovations provide a hint of how operators will continue to be able to leverage their hybrid fiber coax networks to great advantage as Moore's Law continues to drive processing efficiencies.

RGB has been in the market awhile with its highly condensed edge devices built on what it calls the Video Intelligent Architecture. By applying this architecture in various components designed for specific tasks, RGB hopes to create a flexible step-by-step approach to adopting its solutions where operators can mix and match them with other vendor products or use them altogether in a seamlessly integrated array of next-gen edge machines.

"When we started working on Video Intelligent Architecture, we saw that the industry was moving to more personalized services, which would require much higher density processing to accommodate all the requirements," says Adam Tom, executive vice president and co-founder of RGB. "This means you have to handle time shifting and place shifting from many sources to multiple devices."

Such real-time, high-density video processing entails functions such as digital modulation, digital ad insertion, video switching, digital encryption, transcoding and video rate shaping, Tom noted. This could only be done with components that minimized space consumed in headends and regional distribution hubs while maximizing functional capabilities.

The company did well with its first product, a simulcast edge processor released in August 2005, which minimizes backbone capacity consumption by converting a digital video feed into simultaneous analog and digital streams over the distribution portion of the HFC network. Two more product releases followed where the same VIA framework in one unit supports conversion of up to 24 ASIs (fiber-based Asynchronous Serial Interfaces used in legacy backbone cable TV transport) to eight gigabit Ethernet interfaces and in another unit supports high-density multi-purpose statistical multiplexing, grooming and ad insertion.

Now the company has introduced what has always been a main goal in its edge product strategy – a Universal Scalable Modulator, which takes the industry's new universal edge QAM (quadrature amplitude modulation) concept to new levels of efficiency. Consuming one rack unit (RU) of space, the USM can support up to 128 six-MHz channels and can multiplex up to 1,280 digital programs, notes Ramin Farassat, vice president of product marketing at RGB.

"The industry needs to support higher volumes of on-demand services, including switched digital video multicast and unicast as well as VOD," Farassat says. "But operators tell us that with the products currently in the market, the costs per QAM port per subscriber are too high."

Farassat adds: "We thought we could meet their cost targets with a product that meets density requirements and allows

you to expand capacity by way of software upgrades on a per QAM basis. You don't want to pay for a 128-QAM chassis if you're only doing 24. We support modular upgrades with up to four modules per chassis where each port supports two to eight QAMs. So it's very scalable in a very cost-effective way."

The USM is also the first edge QAM modulator to offer a choice of multiple gigabit Ethernet interfaces as well as a 10gigE interface for video input, Farassat notes. The USM is also designed to support delivery of IP video services in conformity with the requirements of DOCSIS (Data Over Cable Service Interface Specification) 3.0.
Where RGB's play centers on minimizing costs and space consumption to enable next-generation cable network services, Imagine Communications is focusing on new techniques as well as high-density processing to bring much greater bandwidth efficiency to digital programming than is possible with current digital multiplexing schemes.

The company's design, the PersonalizedTV platform, uses innovative third-generation statistical multiplexing technology to achieve bandwidth savings of over 50 percent without losing video quality, says Imagine CEO Jamie Howard. "Imagine's approach is to improve streaming capacity over existing infrastructure while maintaining quality," Howard says. "We do that in a way that scales so that as you experience growth in demand, our technology continues to save you bandwidth."

As explained by Howard, the core of Imagine's technology is a set of innovations the company refers to as "ICEPAC" for Interoperable Compressed Element and Personalized Adaptive Coding. It's a complicated means of packing more bits into a given RF spectrum than is presently possible with variable bit rate (VBR) encoding and statistical multiplexing methods. Moreover, it allows stat muxing over VBR to be performed in unicast channels, where, today, a far less efficient mode known as constant bit rate (CBR) encoding is used.

The ICE part of the technology entails a frame-by-frame assessment of compression requirements that meet subjectively tested thresholds for detecting artifacts on the part of experts and average viewers, which gives a range of tolerance within which the stored video stream must be maintained once it enters the distribution system. "Our quality subjective algorithm is packaged around research on how the human eye processes motion, color and textures," Howard says. "The algorithm looks at these frames and pixels and measures the requirements for expert and average perception and says, let's store that.

"At ICE we look at every frame and create two versions," he continues. "We store both versions at the Quality-on-Demand Gateway." This is the PAC part of the architecture, which sits at the input to the edge QAM.

"When the frames come in we say let's look at all the different stream segments and optimize the multiplexing at equivalent or better video quality than the minimum requirement," Howard says. "We can do that until we hit an increase of 50 percent in capacity." In today's 256 QAM digital cable systems, this means being able to pack 15 rather than 10 standard definition streams and three rather than two HDTV streams into a single 6 MHz channel.

When it comes to applying this methodology to switched digital broadcast, where the video is transferred in live mode without going into storage, all of this processing must be done within the digital broadcast channel delay envelop, Howard notes. "We will have a real-time digital processor in the SDV architecture right before the SDV server," he says. "We create the ICE files there and have two to four seconds to send them to the gateway. So when the channel change happens, our files are already there."

SDV will be enabled as part of future software releases, Howard notes. The technology will also support ad insertion, network PVR, personalized audio and IPTV, while adding various new features personalized to the individual subscriber.

EXHIBIT 7

imagine™
COMMUNICATIONS

For Immediate Release

Imagine Communications Launches the Industry's First Switched Digital Video Solution Incorporating Variable Bit Rate and Statistical Multiplexing

Dramatically Improves Video Quality and Bandwidth Efficiency on Existing Switched Digital Video (SDV) Cable Infrastructure

Initial Product, SDV Staging Processor, to debut at
NCTA's The Cable Show '07, May 7-9 in Las Vegas, Booth #3680

SAN DIEGO, Calif. – April 23, 2007 – Imagine Communications, developer of the industry's most powerful and scalable digital video platform, today announced its Switched Digital Video (SDV) system, the cable industry's first SDV solution enabling Variable Bit Rate and statistical multiplexing (VBR/StatMux).

Imagine's SDV system, comprising the SDV Staging Processor and the Quality On Demand Gateway (QOD Gateway™), features an open and modular design, and provides operators dramatic video quality and bandwidth efficiency improvements.
Both the SDV Staging Processor and the QOD Gateway incorporate Imagine's innovative software and leverage powerful, carrier-grade, off-the-shelf hardware available from multiple suppliers. They also plug seamlessly into existing SDV infrastructure.

Imagine Communications' President and CEO Jamie Howard said, "One of the goals of a successful SDV deployment is maintaining the quality of experience for digital cable subscribers with respect to video quality and channel change latency. Imagine's SDV system not only addresses these objectives, but also delivers up to 50 percent more streams per QAM channel. We are excited to introduce our SDV Staging Processor, the initial product of our SDV system, immediately giving operators and their subscribers a significant boost in video quality."

Importantly, cable operators can use the SDV Staging Processor on a standalone basis (i.e., without Imagine's QOD Gateway statistical multiplexing device), instead of current clamping devices that significantly degrade the incoming digital broadcast signals. An integral software component of Imagine's SDV Staging Processor is the ICE-Q™ (Interchangeable Compressed Elements-Quality) video quality measurement subsystem, ensuring the best video quality at any given bit rate.

The immediate benefits of Imagine's SDV Staging Processor include:
• Improved video quality relative to today's SDV clamping devices, while maintaining the standard 3.75 Mbps CBR (Constant Bit Rate) signal. In this scenario, 10 SDV streams can share the same 256 QAM channel at equivalent video quality to the digital broadcast source, and at noticeably higher quality compared to existing SDV clamping products.

• Consistent video quality across the span of channels in the SDV tier, through use of Imagine's multi-rate CBR feature. In this case, Imagine's ICE-Q video QoS capability ensures that difficult (to compress) services will have equivalent perceived quality relative to easy signals. The CBR rate for each service is automatically determined by analyzing actual empirical data from each signal.

Virtually all digital broadcast signals take advantage of VBR/StatMux in order to deliver the best video quality at the most efficient bit rate. The modular addition of Imagine's QOD Gateway, at the network edge, brings these benefits to SDV, enabling end-to-end VBR and up to 15 SDV signals statistically multiplexed in a 256 QAM channel, while maintaining the video quality of the incoming VBR digital broadcast signals. The QOD Gateway allows operators to maintain centralized bulk encryption of their SDV signals.

Imagine-processed VOD and SDV signals can also be multiplexed through a common QOD Gateway hardware platform and can support optimized EdgeQAM sharing. Also, Imagine's products employ industry-standard open interfaces, allowing interoperability with any Session or Edge Resource Manager (SRM/ERM), EdgeQAM device and VOD server.

About Imagine Communications
Imagine Communications has launched the industry's most powerful and scalable digital video platform enabling system operators to costeffectively increase bandwidth efficiency and video quality. Imagine's Quality on Demand Product Suite (QOD Product Suite) incorporates breakthrough next-generation variable bit rate and statistical multiplexing technology (VBR/StatMux), enabling up to 50 percent more streams per QAM versus today's Constant Bit Rate (CBR) approach. Imagine's state-of-the-art ICE-Q™ video quality measurement algorithms enable better video quality at any given bit rate. Imagine is based in San Diego with R&D and engineering in Israel. Its strong management team includes industry leaders with decades of experience delivering innovations in video communications. Founded in 2005, Imagine Communications is privately held and funded by Carmel Ventures and Columbia Capital. For more information, visit www.imaginecommunications.com.

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EXHIBIT 8

For Immediate Release

Imagine Communications Showcases its Quality On Demand (QOD) Product Suite for VOD, HD-VOD and Switched Digital Video at NCTA's The Cable Show 2007 May 7-9 in Las Vegas

Allows Operators to Deliver More Bandwidth-Hungry Programming and Applications on Existing Networks with Improved Video Quality; Includes Debut of Staging Processor for Switched Digital Video

Imagine's Ron Gutman Presents NCTA Technical Paper on Switched Digital Video and Cable IPTV on Wednesday, May 9

SAN DIEGO, Calif. – April 30, 2007 – Imagine Communications, developer of the industry's most powerful and scalable digital video platform, today announced plans to showcase its Quality On Demand (QOD) Product Suite at the National Cable Television Association's (NCTA) The Cable Show '07 to be held in Las Vegas at the Mandalay Bay Convention Center on May 7-9. The QOD Product Suite features Variable Bit Rate and Statistical Multiplexing (VBR/StatMux) innovations for the VOD, HD-VOD and Switched Digital Video (SDV) markets. In addition, Imagine's co-founder and CTO Ron Gutman will present his paper entitled *"Switched Unicast via Edge Statistical Multiplexing"* during the session called *"Across the Spectrum: New Approaches for Managing Bandwidth"* on Wednesday, May 9, 8:00a.m.-9:15 in the Breakers H Room.

Imagine Communications' SVP Marketing & Business Development Marc Tayer said, "At The Cable Show '07, we will be demonstrating the benefits of enhancing operators' VOD, HD-VOD, and SDV services with VBR/StatMux, dramatically improving bandwidth efficiency and video quality. We will also debut our new SDV Staging Processor, our initial product in the SDV market segment. This is a high-density, carrier-grade solution for improving video quality of SDV signals. While the SDV Staging Processor can be used on a standalone basis to improve video quality, when used together with the QOD Gateway, it represents the industry's first end-to-end VBR/StatMux solution for SDV, enabling up to 50 percent more streams per QAM at digital broadcast quality."

In Imagine's booth #3680 at The Cable Show, among the solutions and demonstrations scheduled to be shown are:

- The QOD Gateway™ (Quality On Demand Gateway) system supercharges VOD expansion with much greater streaming capacity (up to 50 percent more streams per QAM channel) and enhanced video quality. The VOD system comprises the VOD Processor and the QOD Gateway, allowing three (3) HD-VOD Variable Bit Rate (VBR) streams to share a 256 QAM channel with equivalent video quality relative to today's maximum of two (2) Constant Bit Rate (CBR) HD-VOD streams. Similarly, up to 15 SD-VOD VBR streams can occupy a 256 QAM channel vs. today's maximum of 10, with no video quality degradation relative to the source. SDV streams and ad

insertion can also be multiplexed through the same QOD Gateway system. The QOD Gateway is a carrier-grade, off-the-shelf hardware platform, with Imagine's software, based on the MicroTCA standard.

- Imagine's ICE-Q™ (Interchangeable Compressed Elements-Quality) video quality measurement subsystem and algorithms is what gives operators unprecedented Video Quality of Service (Video QoS), and enables Imagine's impressive and industry leading performance for both video quality and bandwidth efficiency.

- Imagine's SDV Staging Processor, which ingests digital broadcast MPEG-2 SDTV (or HDTV) signals and outputs them, in CBR format, at a higher video quality for any given bit rate relative to today's SDV clamping products. With the optional addition of the QOD Gateway, end-to-end VBR/StatMux can be employed, enabling up to 15 high-quality signals per QAM channel.

- Imagine's QOD Management software, which includes automatic synchronization and provisioning with operators' existing network topology.

Imagine's software architecture runs on carrier-grade off-the-shelf hardware and plugs seamlessly into existing infrastructure. The QOD Gateway is a 5RU (rack unit), NEBS-compliant platform which offers unprecedented stream count density at 36 Gbps throughput, equivalent to roughly 13,000 SDTV or 3,000 HDTV streams.

The QOD Product Suite is optimized for the VOD, HD-VOD and SDV applications. Imagine's solutions are compatible with VOD pre-encryption and session-based encryption, as well as SDV centralized bulk encryption. They are also fully interoperable with VOD servers, Session Resource Managers (SRM), EdgeQAMs and set-tops from multiple suppliers.

Future software releases will apply Imagine's core technology to other personalized applications including targeted ad insertion, networked PVR (nPVR), IPTV, personalized audio and more, while adding various new features personalized to the individual subscriber.

About Imagine Communications

Imagine Communications has launched the industry's most powerful and scalable digital video platform enabling system operators to cost-effectively increase bandwidth efficiency and video quality. Imagine's Quality on Demand Product Suite (QOD Product Suite) incorporates breakthrough next-generation variable bit rate and statistical multiplexing technology (VBR/StatMux), enabling up to 50 percent more streams per QAM versus today's Constant Bit Rate (CBR) approach. Imagine's state-of-the-art ICE-Q™ video quality measurement algorithms enable better video quality at any given bit rate. Imagine is based in San Diego with R&D and engineering in Israel. Its strong management team includes industry leaders with decades of experience delivering innovations in video communications. Founded in 2005, Imagine Communications is privately held and funded by Carmel Ventures and Columbia Capital. For more information, visit www.imaginecommunications.com.

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EXHIBIT 9

new video TECHNOLOGY

Friday, 15 June 2007

Imagine Communications claims 'jaw dropping' reaction for VOD statmuxing

Imagine Communications claims the reaction to its new VBR statmuxing solution for VOD and Switched Digital Video (SDV) is "jaw dropping" among those cable operators who have seen it. The innovative solution is said to enable 50 per cent more video streams per QAM channel without a reduction in picture quality, taking the benefits of statistical multiplexing beyond broadcast television for the first time. Two major US cable operators are testing the system and all product components should be shipping by the end of this year.

The Imagine Communications solution uses powerful video processing (partial decode and partial re-encode) to improve the picture quality on Constant Bit Rate (CBR) video streams. In the case of VOD, an offline process effectively removes inefficiencies in the original MPEG-2 encode and outputs a typical VOD-compatible 3.5Mbps SD stream or 15Mbps HD stream but with higher picture quality. For Switched Digital Video, this CBR processing is said to outperform other SDV clamping products.

The efficient CBR streams can be exploited in their own right to improve picture quality, Imagine Communications suggests, but the addition of a Quality on Demand Gateway at the network edge introduces statistical multiplexing as well. The optimised CBR streams exit the headend in Single Programme Transport Stream (SPTS) format and are transported across the cable backbone in this form, mirroring the existing architecture for both SDV (whether multicasting today or unicasting in future) and VOD.

The Constant Bit Rate SPTS then enters the QOD Gateway (at a regional headend or hub, for example) where the programme streams are then grouped into a multiplex using statistical analysis to ensure the most efficient line-up based on the SDV/VOD programme streams that are being requested by local subscribers at any given moment. The QOD Gateway draws upon the video pre-processing carried out in the headend to convert the streams into Variable Bit Rate and a Multiple Programme Transport Stream (MPTS) exits the QOD Gateway for last mile transmission.

No changes are imposed on the VOD servers, edge-QAMs or set-top boxes and the video is standard MPEG-2 (or MPEG-4 AVC at a later date). Imagine Communications says the result is 15 standard-definition VOD or SDV programmes within a 256 QAM channel instead of the ten that is typical today in the same spectrum. Marc Tayer, SVP of Marketing & Business Development for Imagine Communications, says these claims have been comprehensively proven at the two US cable operators who have been testing the solution for months.

The impact of this solution - if mirrored in real deployments - is likely to be dramatic. US cable operators are now racing their DTH satellite rivals to deliver 100 channels of HDTV and the need to introduce HD-VOD alongside continuing increases in broadband speeds is creating a bandwidth crunch. The key, says Imagine, is that the improved bandwidth efficiency does not come at a price in terms of picture quality. "That is what was seemingly impossible until now," says Tayer.

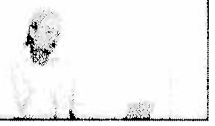
Imagine Communications, which is headquartered in San Diego, California, believes its technology will also interest IPTV providers but the initial focus is on North American cable this year and other cable markets starting in 2008. The company is taking its QOD Gateway, ICE-Q video quality measurement sub-system and SDV Staging Processor (which outputs high-quality CBR across the backbone) to market itself, but will work through partnerships as well and has already announced plans to integrate with TANDBERG Television's OpenStream SDV platform.

Imagine Communications was founded in 2005, is privately held and funded by Carmel Ventures and Columbia Capital. Its first round of venture capital funding raised $9.2 million and B-round financing is planned for this year. The company has 40 R&D engineers in Israel and six in San Diego and according to Tayer, the R&D effort is where most of the money is going today.

What has emerged from that R&D is the separation of the video pre-processing required for statistical multiplexing and the multiplexing itself, and that marks a fundamental change in how MPEG video has been handled previously.

Tayer explains: "We perform the video processing for a video stream once in advance and that is really the heavy lifting. We don't change the existing CBR encoding so operators use their installed MPEG-2 encoders running at 3.75Mbps SD and 15Mbps HD. Our VOD processor [or SDV Staging Processor] takes those CBR files and determines, frame by frame and on a macro-block by macro-block basis, where we can code the video at lower bit rates so that an expert eye cannot tell the difference.

"So we are taking advantage of how inefficient CBR is, and intelligently looking at each frame and macro-block and determining where we could encode at a lower bit rate. We are not replacing the primary encoding that compressed the video into MPEG-2 but performing additional downstream processing.



"In any kind of statistical multiplexing device there is some decoding and re-encoding and then the actual statistical multiplexing. Instead of doing this all in one box as the streams are presented - which is what traditional statmux devices do - our solution performs a partial decode and re-encode totally separately from the statistical multiplexing, and only once per asset."

This video is then 'statmux-ready' and fully compatible with video servers (it has been tested with SeaChange International, Concurrent and C-COR video servers without any problems, Imagine says). The video is still CBR and Single Programme Transport Stream at this point and is then transported to the QOD Gateway where it is statistically multiplexed.

"Because we have already processed everything in advance, there is no heavy lifting. We are statmuxing using information from the pre-processor. We see that for this QAM, these 14 or 15 streams will all go over the same QAM channel and we use the metadata from the front-end processing to create an efficient statmux," explains Tayer. "The output from the gateway is MPTS and VBR."

The QOD Gateway is a 5RU device and is made from carrier-grade, off-the-shelf hardware combined with Imagine's software. This unit will process 36Gbps throughput, equivalent to around 13,000 standard-definition or 3,000 HDTV streams. "That is unprecedented stream count density," Imagine Communications declares in its marketing literature.

Industry events

"VBR and statistical multiplexing are not new, and are used on live broadcast TV of course, but there was no cost-effective solution for VBR statistical multiplexing on VOD and Switched Digital Video," Marc Tayer continues. "CBR works but requires a lot of bandwidth and it constrains video quality and that was one of the fundamental problems we set out to solve - bringing the benefits of VBR statmuxing to the VOD, SDV and, eventually, IPTV markets."

Imagine Communications claims the introduction of 'traditional' broadcast-style statmuxing to VOD would double the cost per stream, which is one of the reasons it has never been considered. "The rack space requirement of a traditional statmux approach is also very high - 20 times higher than what we are accomplishing," says Tayer.

The end-to-end VOD/SDV solution is nearing market readiness. "We have finished the video quality testing and that really means the VOD processor in the case of Video on Demand and the SDV Staging Processor in the case of SDV," Tayer explains. "These are the products where we have the video quality sub-system that improves CBR quality.

"The next step is the QOD Gateway for statistical multiplexing and that is set for testing in Q4. The SDV Staging Processor can be released as a product separately from the QOD Gateway so that would give better video quality to any given CBR stream on Switched Digital Video deployments and those streams would be statmux-ready. We believe we can start shipping that this year."

Report: John Moulding

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EXHIBIT 10

Attack the HDTV Bandwidth Challenge with a Powerful Technology:

VBR/StatMux for VOD and SDV

Originally published in conjunction with SCTE Cable-Tec Expo 2007 (June 19-22, 2007)

Marc Tayer
Imagine Communications
SVP, Marketing & Business Development
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July 1, 2007

1. Overview

With U.S. HDTV penetration exceeding the 20 percent consumer threshold and quickly accelerating, the next major battleground for premium video subscribers will revolve around HDTV content quantity and video quality. The day of 100 HDTV channels is on the horizon. And with Blu-ray, HD-DVD and HD camcorders delivering spectacular HD pictures, consumer video quality expectations are on the rise.

Cable is moving Video on Demand (VOD) to the mass market, and operators have a 1-2 year window of opportunity to capitalize on the potential of HD-VOD before TelcoTV operators either become formidable threats on their own or acquire the DBS companies. But the rich promise of HD-VOD comes with a painful cost; HD-VOD is the king of all bandwidth hogs, underscoring the need for a more bandwidth-efficient video processing technology.

The axiom "never enough bandwidth" is a rare constant in the dynamic field of communications, and this incessant demand for ever more bandwidth must be addressed in a cost-effective and scalable manner. At the same time, service providers must move up the video quality curve while minimizing disruption to the existing infrastructure. System operators simply can't afford to leave low-hanging bandwidth fruit on the table in the face of such an impending market explosion in HDTV and VOD.

Since the invention of digital television, Variable Bit Rate (VBR) video coding, together with statistical multiplexing (StatMux), has been nearly universally adopted for multiple-service-per-carrier transmission, delivering the best video quality at the lowest bit rate. Today, virtually all multi-channel digital broadcast signals utilize VBR/StatMux.

Furthermore, all DVDs (and now HD-DVD and Blu-ray disks), use VBR for the best video quality at the lowest storage rate. VBR is the natural state of digital video coding, accurately representing the continuously changing peaks and valleys of picture complexity.

It is therefore somewhat puzzling that advanced video service architectures such as VOD and Switched Digital Video (SDV) are being deployed with Constant Bit Rate (CBR) video coding, imposing a severe constraint on both bandwidth efficiency and video quality. It's true that CBR provides bandwidth predictability per video asset, but as these increasingly lucrative services scale up to ubiquity, CBR's deficiencies will become magnified. This will occur just when precious spectrum is needed for expanded delivery of linear HDTV content, VOD, HD-VOD, nPVR, and other bandwidth-intensive services.

What is the common link between these advanced video services causing them to be deployed with bandwidth-inefficient CBR? Unlike digital broadcast service, with these advanced "PersonalizedTV" services, the subscriber - rather than the broadcaster or operator - determines the actual content flowing down the last mile pipe, forming a consumer-initiated streaming environment.

But this common thread of a consumer-driven viewing paradigm still doesn't explain why these advanced services would use CBR in the first place. The underlying answer is that traditional VBR/StatMux systems were developed for digital broadcast service, and at the time operators launched these advanced services, there were no viable solutions in existence, economically or technically, for this fundamentally different, consumer-initiated streaming environment.

If the viewing paradigm has been flipped on its head toward the consumer side, then it logically follows that an optimal technical solution must represent a dramatic departure from the status quo. In a consumer–generated streaming environment, the "heavy lifting" functions of video processing (coding) only need to occur once, in advance, freeing up the "lighter load" task of multiplexing to scale commensurately, and infinitely, with the consumer demand for streams.

Two important design considerations to address this substantial technical challenge are:

(a) the complete separation of video coding and multiplexing; and

(b) utilization of an accurate, objective video quality measurement technique to resolve the apparent paradox of simultaneously enabling greater bandwidth efficiency AND enhanced video quality.

2. HDTV Competitive Environment

When the first digital HDTV broadcast system was unveiled to the FCC in June 1990, the market response quickly moved from stunned disbelief to the more pragmatic question of timing. Yet, only the biggest skeptics would have predicted a 17-year gestation period for HDTV to reach the mass market consumer. That painfully long period was required in order to overcome the stubborn interdependencies of politics, technical standards, content availability and consumer equipment cost. With this market development logjam finally broken wide open, HDTV is the new rage for home television viewing. In 2006, HDTV sets outsold analog NTSC TV sets for the first time in the U.S., with household penetration currently exceeding 20 percent. Kagan Research projects 81 percent penetration by 2010.

After acquiring 30 million subscribers in 13 years, U.S. DBS growth is decelerating primarily due to cable's successful triple-play offering of video, data and voice. But with cable going directly after the voice market, telcos have no choice but to aggressively enter the video market. Regarding HDTV, DirecTV's CES 2007 proclamation of 100 digital HDTV channels has set the stage. The next battleground for attracting and retaining premium video subscribers is HDTV, with content quantity and video quality acting as the heavy artillery.

Table 1 summarizes today's HDTV service provider offerings, along with plans for the future. While HD-DVD, Blu-ray and HD camcorders are media technology platforms rather than service providers, they are nonetheless included for completeness. Importantly, the video quality aspects of these three platforms could become increasingly recognized as superior, due to their ability to offer content in the 1080P format, as well as the much higher bit rates enabled by their expansive storage capacities.

	March 2007 HD Offering	Future HD Plans
DirecTV	11 national channels; NFL Sunday Ticket games and regional sports network games (plus local into locals)	100 national HDTV channels (with capacity for 150); capacity for 1500 local HDs
EchoStar (DISH)	31 national channels (plus local into locals)	Add HD channels; Move "Voom 15" onto CONUS bird; Expand local HD markets
Verizon FiOS	16 national channels (plus locals)	Add linear HD channels and HD-VOD; Buy DirecTV (?)
AT&T U-Verse	23 national channels (plus locals)	Add linear HD channels; Evolve to VDSL2 or add 2nd DSL line for multi-stream HDTV; Buy EchoStar (?)
Cable	Varies by operator, typically 5-15 national channels (plus locals); Comcast: Over 100 hours HD-VOD; Cablevision: June '07, announced addition of "Voom 15" for 37 total HD channels (with locals); Rogers: 39 HD channels (with locals).	Add linear HD channels; Expand HD-VOD offerings; Leverage SDV for certain linear HD channels
HD-DVD	Warner Brothers; Universal; Paramount; New Line	Huge content library; 1080P progressive format and 36 Mbps transfer rate for superior video quality
Blu-ray	Sony Pictures; Disney/Buena Vista; 20th Century Fox; Paramount; MGM; Warner Brothers; Lion's Gate; Blockbuster	Huge content library; 1080P progressive format and 36 Mbps transfer rate for superior video quality
HD Camcorders	Consumer and "Prosumer" content	Superior video quality; peer-to-peer and "over the top" Internet

Table 1: HDTV Offerings by U.S. Service Providers and Other Platforms

The ability to offer a wide variety of HDTV content at excellent video quality is already becoming crucial for attracting and retaining premium subscribers. DBS operators will offer HD tonnage and attempt to lock up HD sports rights, while dedicating entire spot-beam satellites for local into local signals (so their subscribers can avoid separate terrestrial antennas). Cable operators will increasingly turn to HD-VOD as a competitive differentiator. Being fully switched, TelcoTV/IPTV operators can offer unlimited linear HD content, but will struggle with multi-stream HD unless they have Fiber to the Home (FTTH).

And perhaps most notably, consumers will become spoiled by the unprecedented picture quality from HD-DVD, Blu-ray and HD camcorders, and will start demanding similar quality from their service providers. In particular, the latest hot HD consumer feature is "1080P," and manufacturers and retailers of these platforms are starting to market their ability to give consumers "1080P quality." Since it's impractical for service providers to broadcast 1080P signals in the short run, they will need to improve the picture quality through other means, such as increasing the bit rate or employing more advanced video quality enhancement techniques.

These competitive dynamics point to an immutable law of video delivery: there is never enough bandwidth. Stated another way, in the era of 100 HD channels, service providers need to make optimal use of their finite spectrum; CBR for VOD and SDV must give way to VBR/StatMux upon availability of an economically and technically viable solution.

3. VOD and SDV: Cable's Advanced Digital Video Service Architectures

More than a decade has now passed since cable began broadcasting digital TV signals, and digital cable household penetration now exceeds 40 percent nationwide. Prominent extensions to the digital cable revolution include VOD (starting in 2000) and SDV (in 2006).

Successful expansion of these two important service platforms is essential for cable to sustain and enhance its leading subscriber market share position. VOD gives subscribers enormous content libraries, with the consumer convenience of starting the stream at any time, supplemented by pause, fast forward and rewind capabilities. From a competitive standpoint, VOD is cable's best video differentiator against DBS, whose only near-term responses are pre-loading DVRs with files or using broadband Internet pipes and hybrid set-tops.

Cable's unique ability to offer HD-VOD raises the stakes even further. DBS operators could pre-load their subscribers' DVRs with HD-VOD files, but this would consume too high a percentage of the set-top's hard drive, and the Internet is still too "narrow" for HDTV. Cable has a 1-2 year window of opportunity to capitalize on this advantage. Beyond this timeframe, either the telcos will acquire the DBS operators, or the telcos will have built out their FTTH or advanced DSL infrastructures toward a critical mass. Either way, they will eventually be able to offer a competitive HD-VOD service. A combined TelcoTV/DBS offering could merge the downstream payload of a VOD satellite with the upstream DSL path for commands and trick modes.

With HD-VOD being cable's sharpest and most effective strategic angle against DBS, what is inhibiting cable operators from aggressively marketing HD-VOD to their subscribers? Certainly

content availability is an issue, but where there's a will there's a way, as proven by Comcast toward the end of 2006 when it exceeded it goal of obtaining 100 hours of HD-VOD content.

The thornier HD-VOD issue is bandwidth, especially in order to deliver excellent video quality. Since a single HD-VOD stream is equivalent to four SD-VOD streams, optimizing the video quality for any given bit rate is essential. In other words, CBR becomes more problematic in the face of a cost-effective VBR/StatMux alternative.

SDV is proving to be a very effective architecture for adding certain types of linear services to cable's content repertoire. Instead of continuously transmitting all services to all subscribers, SDV services only occupy bandwidth if and when one or more subscribers in a service group request the specific signal. This makes SDV an ideal solution for adding niche and other less popular programming. If the operator is careful about which content is placed on the SDV tier, then significant bandwidth savings can be achieved over digital broadcast.

The bandwidth-saving capability of SDV, however, is being compromised by the use of CBR "clamping." When the incoming VBR digital broadcast signals are transferred to the SDV environment, one of the first actions is to clamp them to CBR. For a difficult (to compress) signal, if the CBR rate is not sufficiently high, noticeable artifacts will appear due to the chopping off of the video peaks. And for a relatively easy signal, a typical CBR of 3.75 Mbps uses much more bandwidth than necessary (i.e., most of the time, the same quality could have been achieved at a much lower average VBR rate). To address this problem, some operators are planning to move to multi-rate CBR. While multi-rate CBR will allow quality to remain more consistent between the various services on the SDV tier, it still utilizes much more bandwidth than necessary (for the resultant quality) due to the fundamental inefficiencies of CBR.

4. Cable's Bandwidth Expansion Options

Cable operators have several bandwidth expansion options at their disposal, but some are far more practical than others in any given timeframe. A common economic language is needed in order to compare the alternatives. While such an economic analysis is beyond the scope of this paper, one method is to look at the various options on a $/sub/6 MHz basis. Such a common metric would help bridge the gap between the cost per home passed concept, typical of node splitting, SDV and plant upgrades, and the cost per stream concept of VOD and HD-VOD.

Measured in this manner, other than further quality/bandwidth improvements in MPEG-2 encoded signals, a cost-effective VBR/StatMux solution for VOD and SDV is, by far, the most economical way for cable operators to free up bandwidth. Enhancing the VOD and SDV architectures by adding VBR/StatMux could cost operators less than $1/sub/6 MHz channel. SDV (with CBR) is the next most cost effective bandwidth creation option ($5-10 per home passed; under $2/sub/6 MHz channel). Other methods generally cost up to 10-25 times more than VBR/StatMux, if measured on this common cost metric basis.

Table 2 shows cable's bandwidth expansion options, with the initial three (3) options in bold representing the "biggest bang for the buck" on a $/sub/bandwidth basis.

Technology	Major Drawback(s)
Post Encoder Video Processing (improves bandwidth efficiency of MPEG-2 HD and SD broadcast tier)	None
VBR/StatMux for VOD & SDV	**Good option; very cost-effective on "$/sub/6 MHz channel" basis; non-disruptive to cable infrastructure**
Switched Digital Video (SDV)	Good cost-effective option, but CBR clamping causes bandwidth inefficiencies and also constrains quality
Split Node	Significant infrastructure capex; coax plant re-routing/re-wiring
HFC Upgrade to ≥ 860 MHz	High infrastructure capex; new set-tops (with wider-band tuners)
Analog Reclamation	Churn risk; digital set-top capex to convert "the other 50%" of subs
Denser QAM (>256)	System performance issues; new set-tops
Spectrum Overlay	Significant cost per home passed
Dense Home Gateway Decoder	High capex (installation at every sub)
MPEG-2 to MPEG-4 AVC (H.264)	High set-top box (and headend) capex

Table 2: Cable's Bandwidth Expansion Options

5. Digital Video Technology: From VBR/StatMux to CBR (and Back Again!)

Since the invention of digital television in the early 1990s, VBR/StatMux has been a key technological element for a very simple reason: it allows the best video quality at the lowest (average) bit rate. But the advanced VOD and SDV architectures, while innovative in their own right, are both being constrained by CBR, primarily due to the lack of a VBR/StatMux solution possessing the necessary cost, density, and other technical requirements.

As shown in Table 3, we are now entering a 3rd Generation phase of statistical multiplexing technologies. The 1st Generation systems involved closed-loop encoders, with the statmux functionality tightly coupled with the video coding functions of the encoder. In the 2nd Generation, the statmux function was decoupled from the source encoder, enabling cable operators to re-package individual services from multiple satellite transponders and to optionally transcode the compressed bitstreams in order to fit more signals in a cable QAM channel.

Both the 1st Generation and 2nd Generation systems apply strictly to digital broadcast signals. The distinguishing feature of a 3rd Generation solution is the ability to apply VBR/StatMux to digital video signals that are directly requested by consumers, such as the case with VOD and SDV. Even though the operator's Session Resource Manager (SRM) controls the actual allocation of streams to the EdgeQAMs, it is the collective subscriber base (per Service Group) that is the ultimate creator of the mux, hence the phrase "Consumer Generated StatMux."

Transcoding and statistical multiplexing are as much art as science, helping to explain the persistent mystique of these esoteric technologies. Nonetheless, the basic principles are fairly straightforward. The transcoder and statmux devices make use of various parameters and information obtainable from a compressed video bitstream in order to re-process the signal and maximize the resultant video quality (or minimize degradation) at the desired bit rate. Within this general framework, there are numerous details and distinctions between competing solutions, relating to such factors as the visual perceptual model, whether processing occurs in the DCT or the pixel domain, how requantization and rate control are accomplished, how motion vectors and motion compensation are handled, and how decoder buffers are utilized.

Table 3 shows the three generations of StatMux, dating from the July 1992 initial deployment of multiple-service-per-carrier digital TV.

	1st Generation VBR/StatMux	2nd Generation VBR/StatMux	3rd Generation VBR/StatMux
Date 1st Used	1992	1999	2007
StatMux Technology	Closed Loop	Open Loop	Open Loop with Video QoS and Consumer Generated StatMux
Mux Generator	Content Provider	System Operator	Subscriber Demand
How mux is created	Television source content is digitized. Then the bit rate of each service is continuously varied, under encoder control, based on number of channels in the encoder/multiplex and the video complexity of each channel.	Fully independent of encoder control. Headend equipment unbundles services from content provider's mux, allows mixing and matching with services from other mux(es), transrates each stream, then statmuxes new package.	Open loop method with following additions: (a) complete separation of coding and multiplexing; (b) video analysis and objective video quality measurement techniques; (c) in response to consumer demand (number of simultaneous streams requested at any time plus video complexity of each stream), headend software statmuxes groups of services.
Primary purpose (apps)	Gives content provider much more efficient bandwidth utilization for digital broadcast services (DBS or satellite distribution to cable headends).	Allows operator to groom, repackage and re-statmux services (for digital broadcast re-distribution over cable/telco plant).	Gives operator much better video quality and bandwidth efficiency for new services such as VOD, HD-VOD, SDV, IPTV, nPVR, targeted ad insertion; also improves video quality and bandwidth efficiency for digital broadcast signals.

Table 3: Three Generations of Video StatMux Technology

The fundamental technical objective of digital video, whether for transport or storage application, is to maximize the video quality for any given bit rate. CBR coding, used by default for VOD, SDV and IPTV, fails this basic test, since it requires a very high bit rate to achieve reasonably good video quality, thereby wasting enormous amounts of bandwidth on a cumulative basis. While CBR coding has the advantage of simplicity (the operator knows the occupied bandwidth of each signal in advance), this advantage quickly evaporates as soon as a cost-effective VBR/StatMux solution is available.

Table 4 shows a hypothetical cable system with approximately 300,000 homes passed. The system is currently at 8 percent peak capacity (concurrent streaming capacity) for SD-VOD. For 2008, this system plans to expand its SD-VOD capacity from 8 percent to 12 percent, and also to begin offering HD-VOD at an initial 5 percent concurrent streaming capacity rate.

In 2008, 20 percent of the digital tuners (178,500) are assumed to be HDTV, so there are 35,700 HD tuners (120 per service group). At 12 percent SD-VOD peak capacity and 5 percent HD-VOD peak capacity, this implies a system-wide need for 19,635 SD streams and 1,785 HD streams (equal to 66 SD streams and 6 HD streams per service group, respectively). Note that the HD streams were deducted before calculating the SD stream total ((178,500 x 12%)-1,785) = 19,635.

With 298 service groups in this system, and counting an HD-VOD stream as equivalent to 4 SD-VOD streams, this implies a total streaming capacity of 26,775 (SD equivalent streams) in 2008. Dividing this result by 298 service groups gives 90 streams per service group, requiring 9 QAM channels using the typical SD-VOD 3.75 Mbps CBR rate. Therefore, with CBR, five (5) additional QAM channels (30 MHz incremental spectrum) are required to accommodate this VOD capacity expansion. Assuming 50 percent more streams/QAM with VBR/StatMux, only two (2) additional 6 MHz channels are required to accommodate the same SD-VOD and HD-VOD capacity expansion, representing an 18 MHz spectrum savings over CBR.

	2007	**2008**
Basic Subs (300,000 homes passed)	200,000	210,000
Digital Subs (D-Subs)	80,000 (40%)	105,000 (50%)
D-Tuners/D-Sub	1.5	1.7
D-Tuners	120,000	178,500
D-Tuners/Service Group	500	600
Service Groups	240	298
Peak SD-VOD Capacity	**8%**	**12%**
HD Set-Top Penetration	10%	20%
Peak HD-VOD capacity	**0%**	**5%**
Peak Streaming Capacity	9,600 SD 0 HD	19,635 SD 1,785 HD
# 6 MHz channel slots needed for VOD (using CBR)	4	9
Total required QAM capacity (with CBR)	960	2,682

Table 4: Cable system assumptions for VOD capacity expansion

Table 5 shows the economic benefits of VBR vs. CBR for this sample system. Substantial savings are achieved from lower capital expenditures on EdgeQAM devices. Much more valuable, but more difficult to quantify, are the savings achieved from utilizing less spectrum. The imputed spectrum savings estimate in Table 5 appears conservative in light of the following sanity check: 300,000 homes passed (HP) in this hypothetical system multiplied by $10 per home passed gives a figure of $3 million. Note, in turn, that this $10/HP figure is very low relative to traditional HFC capacity upgrades, which can cost well over $100/HP. Power consumption and rack savings from using fewer EdgeQAM are not shown, but could also be significant.

Of course, there will be a capital cost to the VBR/StatMux solution itself. The "total savings" figure ($60/stream) therefore represents the financial breakeven point of such a solution.

	Staying with CBR	VBR/StatMux @ 50% more streams/QAM	Savings
EdgeQAM CapEx (@$400/QAM)	$688,800	$331,200	$357,600
Additional 6 MHz channel slots required	5	2	$1,260,000 (imputed value based on $2 per sub per 6 MHz channel saved)
Total Savings			$1,617,600 (not including rack space and power consumption savings)

Table 5: VOD Capacity Expansion and CBR vs. VBR Economics

It is also useful to examine the economic benefits of VBR vs. CBR for SDV. Consider the following assumptions and example:

- 200,000 sub system (300,000 homes passed)
- 120 standard definition services in SDV tier
- 50 percent concentration ratio (stream capacity as percent of services in SDV pool)
- With CBR, 10 services per QAM channel
- With VBR, 15 services per QAM channel
- 250 service groups

Table 6 shows the economic benefits of VBR vs. CBR for SDV. For CBR, 6 QAM channels times 250 service groups times $400/QAM = $600,000 capital expenditures for EdgeQAM devices. For VBR, 4 QAM channels times 250 service groups times $400/QAM = $400,000 capital expenditures, a $200,000 savings just for EdgeQAMs.

As with VOD, the spectrum savings achieved due to using VBR/StatMux instead of CBR are far more valuable than the QAM device savings. The imputed spectrum savings estimate in Table 5 appears conservative in light of the following sanity check: 300,000 homes passed in this hypothetical system multiplied by $10 per home passed (HP) gives a figure of $3 million. Note, in turn, that this $10/HP figure is very low relative to traditional HFC capacity upgrades, which can cost well over $100/HP. Power consumption and rack savings from using fewer EdgeQAM are not shown, but could also be significant.

Of course, there will be a capital cost to the VBR/StatMux solution itself. The "total savings" figure ($66/stream) therefore represents the financial breakeven point of such a solution.

	CBR	VBR	Savings
EdgeQAM CapEx ($400/QAM)	$600,000	$400,000	$200,000
Spectrum required (# of 6 MHz channel slots)	6	4	$800,000 (imputed value based on $2 per sub per 6 MHz channel saved)
Total Savings			$1,000,000 (not including rack space and power consumption savings)

Table 6: SDV CBR vs. VBR economics

To illustrate the magnitude of CBR's inefficiencies on a macro industry scale, consider the following VOD data:

Cumulative SD-VOD streams delivered by U.S. cable operators	7 billion
Constant Bit Rate (CBR) per stream (SD-VOD)	3.75 Mbps
Average viewing time per stream	0.5 hours
CBR bandwidth inefficiency[1]	33%

The above numbers imply that U.S. cable operators, in the aggregate, have sent two (2) Billion Gigabytes of excess data through their HFC pipes due to CBR. This number is so high it can also be expressed as two (2) Exabytes.[2]

[1] A VBR/StatMux solution enabling 50% more streams/QAM (e.g., 15 VBR streams vs. 10 CBR streams), implies a 33% bandwidth waste factor due to CBR.

[2] 1000 Megabytes is a Gigabyte; 1000 Gigabytes is a Terabyte; 1000 Terabytes is a Petabyte; 1000 Petabytes is an Exabyte.

Figures 1 and 2 below show the capacity differential per QAM channel between today's CBR method and VBR/StatMux.

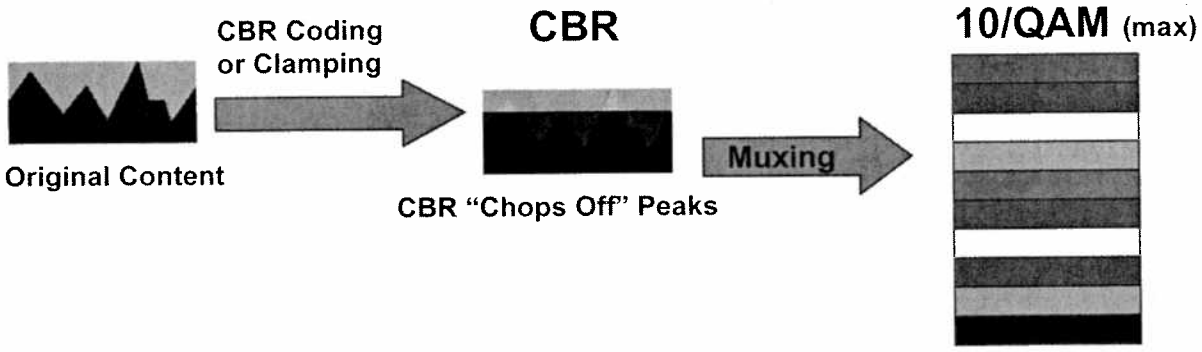

Figure 1: Maximum of 10 SD-VOD CBR streams per QAM Channel

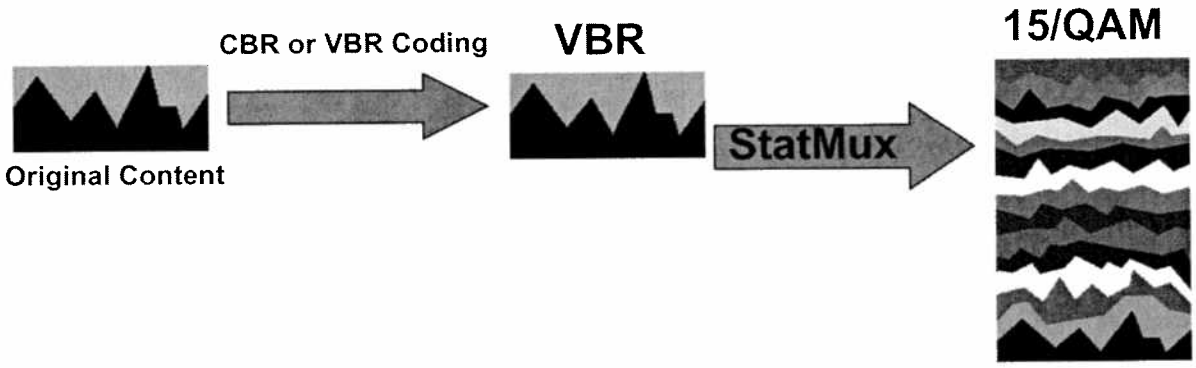

Figure 2: Fifteen (15) SD-VOD streams Per QAM with VBR/StatMux

If VBR/StatMux is such an obvious choice for digital video, then why is CBR used for both VOD and SDV? The fundamental answer is that no viable VBR/StatMux solution was in existence when these services launched. The word "viable" in this context implies both economic and technical issues. If used for VOD or SDV, the traditional statistical multiplexing methods used extensively for digital broadcast signals would run up against insurmountable hurdles in the following areas:

1) Economics (over $100/stream)
2) Rack space inefficiency (under 1000 streams per Rack Unit (RU))
3) Incremental consumer response delay (1-4 seconds)
4) Incompatibility with SDV centralized bulk encryption and VOD pre-encryption

6. Scaling Up PersonalizedTV Services Requires a New Technological Approach

In order to overcome these four hurdles, and thereby deliver the video quality and bandwidth efficiency benefits of VBR/StatMux to VOD, SDV, and other PersonalizedTV services, a radically different technological and architectural approach to video processing and statistical multiplexing is required. It must be based upon "Consumer Generated StatMux" dynamics rather than the traditional method in which the content provider or system operator determines in advance which digital signals make up the RF mux.

The broadcast-oriented technique of performing both the video processing and multiplexing functions in tight sequence, every time a mux is created, is inapplicable to the PersonalizedTV environment in which consumers determine the streams flowing down the last mile pipes.

A viable approach to solving this vexing problem requires a fundamental technology shift with at least two major differences relative to traditional statistical multiplexing methods. The first major difference involves a complete separation of video processing (coding) and multiplexing. With this division of labor, alternative compressed elements can be prepared in advance and indexed by quality measurement criteria. These alternative elements are called Interchangeable Compressed Elements (ICE). Then, the optimal elements can be selected on-the-fly for channel multiplexing in response to instantaneous consumer demand.

This separation of coding and multiplexing has major beneficial cost implications. With approximately 98 percent of the workload being performed only once per VOD file (or once per signal for SDV), the relatively easy 2 percent recurring workload can be delegated to the statistical multiplexing device. In this manner, the solution has the attribute of being able to scale commensurately with the number of streams being demanded by subscribers, a perfect fit for the dynamics of consumer-initiated video content such as VOD and SDV.

The notion of moving the StatMux function to the network edge, facilitated by the separation of coding and multiplexing, has important implications for cable's ongoing architectural and service evolution. An Edge StatMux is ideally positioned not only for end-to-end VBR but also for delivering increasingly personalized services, such as targeted ad insertion and SDV Unicast. Furthermore, by working in conjunction with EdgeQAM devices, QAM sharing of VOD, SDV, and potentially other signals is facilitated and further optimized.

Separation of the coding and multiplexing functions also allows unprecedented stream count density to occur (thousands of streams per RU), since the StatMux device is doing much less work on a recurring basis. Finally, negligible incremental consumer delay is incurred (trick modes for VOD or channel change for SDV), since the time-consuming and processing-intensive video coding portions have been accomplished in advance.

The second major difference from traditional statistical multiplexing techniques is incorporation of an objective video quality measurement subsystem. Imagine's ICE-Q™ video quality measurement algorithms are built into the video pre-processing software. By accurately

emulating the human visual perceptual system, ICE-Q is the industry's first video quality system of its kind, enabling the best video quality performance at any bit rate. By analyzing frames of compressed video, as well as macroblocks within these frames, the subsystem can effectively determine which specific sections of video can be coded at lower bit rates without impacting the video quality. In other words, the algorithms determine precisely where the waste exists in the CBR VOD file, and then exploit these inefficiencies with VBR/StatMux. And the same process can be applied to live VBR digital broadcast signals in the case of SDV, nPVR and traditional digital broadcast.

The video quality measurement technology can also be used to achieve true video Quality of Service (QoS) in a consumer-generated streaming environment. Unlike digital broadcast, in which the cable operator or content provider pre-determines the digital service line-up for each multiplex, with VOD and SDV the composition of the digital line-up per multiplex is not known in advance. The video quality measurement algorithms are therefore used to analyze the available streams in advance, employing a deterministic manner for VOD and utilizing empirical data for SDV. The effective bit rate (similar to VBR average) can then be provided to the Global Session Resource Manager (G-SRM) or Edge Resource Manager (ERM) to facilitate video QoS and more intelligent load balancing.

Importantly, this intrinsic video QoS capability enables customers to calibrate the system, including the ability to decide the optimal tradeoff between bandwidth efficiency and video quality. It has already been shown that state-of-the-art algorithms are sufficiently powerful to enable, even for difficult content, 15 SD-VOD VBR streams or 3 HD-VOD VBR streams in a 256 QAM channel, at equivalent quality relative to today's capacity of 10 SD-VOD CBR streams or 2 HD-VOD CBR streams. Even better performance is expected for SDV, since the VBR digital broadcast sources are generally higher quality than CBR VOD source files.

In Figure 3, three (3) difficult HD-VOD CBR files (each encoded at 15 Mbps) were input into a video pre-processing subsystem with intrinsic video quality measurement capability. The pre-processor analyzes each stream, and then employs the video QoS algorithms to create Interchangeable Compressed Elements (ICE), effectively constructing a VBR signal with the same quality as the source video. Using metadata from the pre-processor, the downstream StatMux device then optimally packs the 38.8 Mbps 256 QAM channel.

In Figure 4, a similar result is shown for sixteen (16) SD-VOD VBR signals, each originally encoded at 3.75 Mbps CBR.

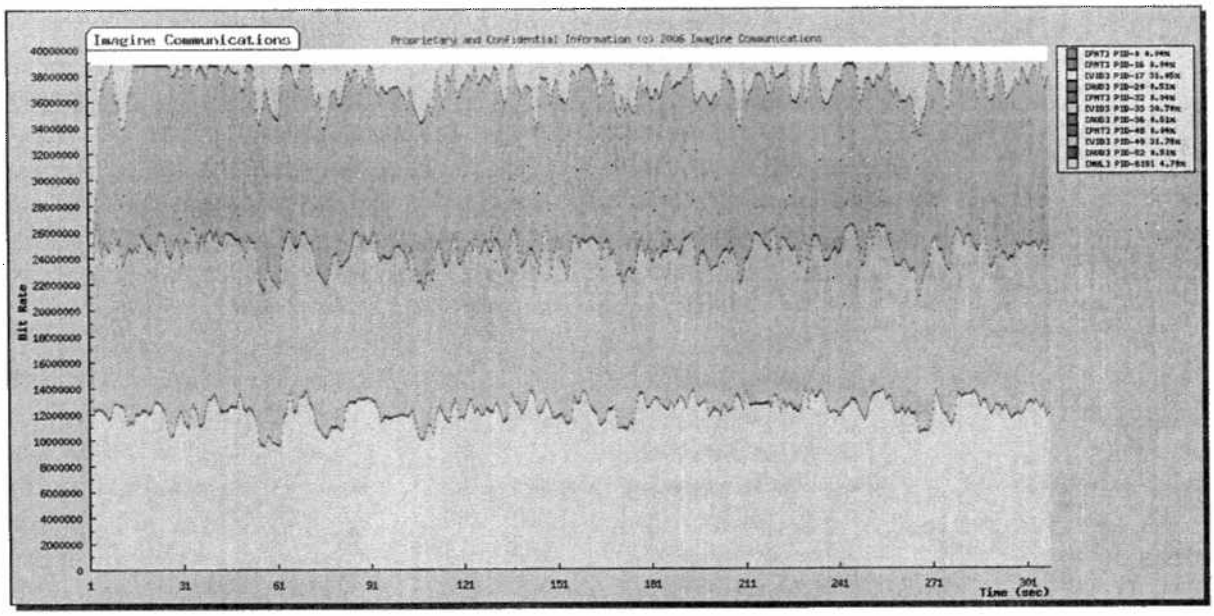

Figure 3: Three (3) HD-VOD VBR Streams in 256 QAM Channel

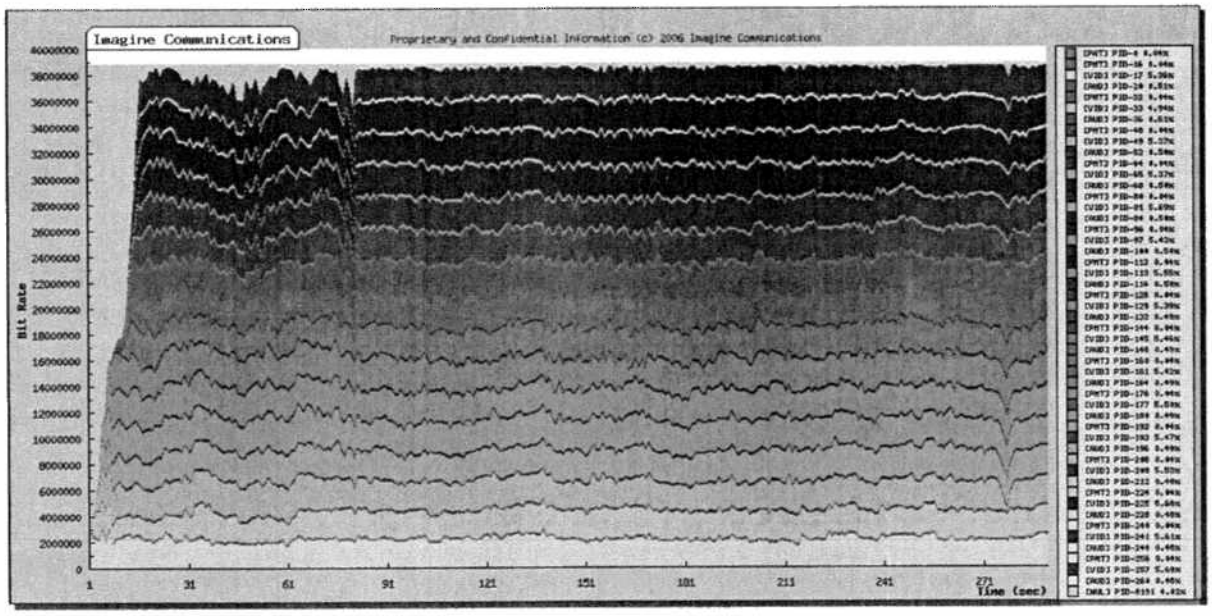

Figure 4: Sixteen (16) SD-VOD VBR Streams in 256 QAM Channel

Figure 5 depicts a high level network diagram, with the pre-processing functions (VOD Processor and SDV Staging Processor) and the statistical multiplexing function (QOD Gateway) plugging seamlessly into the existing cable infrastructure.

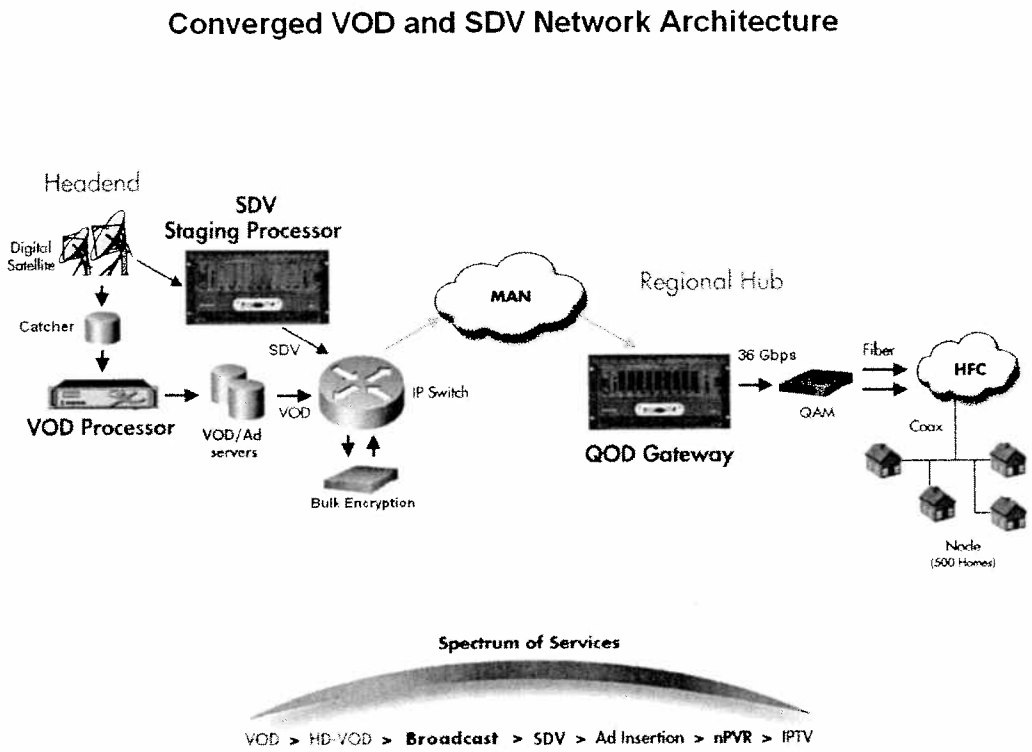

Figure 5: VBR/StatMux Solution in VOD/SDV Cable Infrastructure

7. Conclusion

HDTV is finally on the fast track to ubiquity. Premium subscribers will gravitate toward operators offering the most HDTV content and the best video quality, along with convenient and highly attractive services such as HD-VOD. For operators, attaining this pot of gold requires resolving the huge bandwidth challenges imposed by HDTV and VOD.

Cable operators have multiple options for creating new bandwidth, giving them a strong ability to compete effectively against increasingly aggressive DBS and TelcoTV service providers. Each operator should devise a comprehensive and multi-faceted bandwidth optimization plan, with an initial emphasis on the most cost-effective and most easily deployable solutions. Improving the bandwidth efficiency of MPEG-2 encoders (HD and SD), such as through a "post encoding" process, is the most straightforward and least expensive option. Next in line is the conversion from CBR to VBR/StatMux, effectively increasing VOD and SDV streams per QAM by up to 50 percent without degrading video quality. This option is also easy to plug into existing infrastructure, and saves rack space, power, and capital expenditures due to a 33-50 percent reduction in required EdgeQAM devices.

By leveraging Imagine's VBR/StatMux solution for VOD and SDV, operators will be able to massively scale their deployments, while providing better video quality to surpass competing platforms while preserving valuable spectrum for the upcoming HDTV bandwidth explosion.

EXHIBIT 11

2008 QAM Before The Storm

Seamless Streaming: The Future of Switched Digital Video Panel

January 14, 2008

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The 2007 Competitive Environment Heats Up
Print ad wars and law suit battles

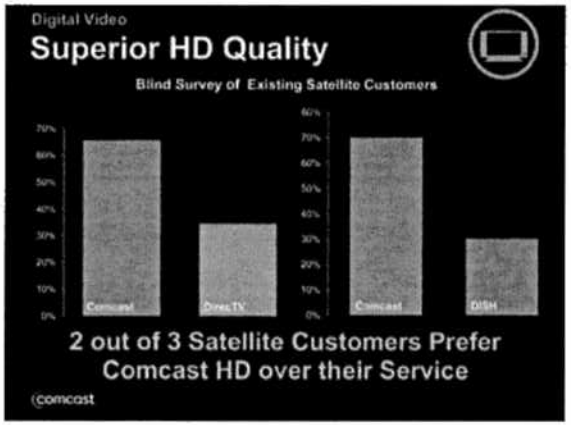
Ad wars in print

Comcast wins the HD Picture Challenge.

Satellite customers agree: HD looks better with Comcast.

HD is all about picture quality. That isn't news. But it is news whose picture is better. In a side-by-side picture quality test, even satellite customers agreed that Comcast HD has a better picture.

Comcast HD. The way HD was meant to be.



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Lawsuits

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Advertising & Marketing Inside Money

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Judge blocks DirecTV ads claiming high-def superiority to Time Warner

Posted 2/5/2007 3:50 PM ET

E-mail | Save | Print | RSS

NEW YORK (AP) — A judge Monday blocked DirecTV Group from airing advertisements in which Jessica Simpson and William Shatner say its high-definition television service provides better pictures than Time Warner Cable's high-definition service.

Multichannel News

DirecTV Cites Comcast Media Center in False-Advertising Suit

DBS Provider Claims Cable Operator-Owned Facility Rendered Survey Results Inadequate

By Linda Moss -- Multichannel News, 7/27/2007 2:35:00 PM

DirecTV Thursday filed an amended false-advertising suit against Comcast, alleging that **Comcast Media Center** participated to produce an "inadequate survey" claiming that two-thirds of satellite customers believe the cable operator has the best HDTV-picture quality.

RELATED ARTICLES

New Twist in Comcast-DirecTV Tussle

Multichannel NEWS WIRE

DirecTV Sues Cox Over HD Ads

DBS Operator's Lawsuit Follows Similar Claim Against Comcast Around High-Definition Marketing

By Todd Spangler -- Multichannel News, 10/18/2007 2:58:00 PM

High-definition TV is in the courtroom yet again.

The 2007 Competitive Environment Heats Up
High profile TV ad Wars

Quantity

DirecTV Back to the Future Commercial (Click Here)

DirecTV Give You 30 Seconds Commercial (Click Here)

Quality

DirecTV Pamela Anderson Commercial (Click Here)

DirecTV Jessica Simpson Commercial (Click Here)

You Tube Video Links

Initial Launches of Broadcast, VOD, & SDV Constant Bit Rate vs Variable Bit Rate

CBR for Narrowcast

- **Was the best time to market option for VOD and SDV**
  - Simple stream management
  - No cost effective VBR solution available
  - No practical VBR solution available Equipment densities only supported 30 to 40 QAMs and not the 1000's necessary for VOD & SDV.
  - Traditional stat-muxing could add consumer response delay
  - Encryption challenges
  - No need for QAM sharing across SDV, VOD and other services
  - Limited VOD titles keep demand low & video quality was not paramount

VBR for Broadcast

- **Proven efficiency track record and quality optimized for broadcast applications**
  - Yields a smaller quality variance resulting in more consistent quality
  - Yields higher quality for complex video content
  - Yields higher bandwidth savings on simple video content
  - Easy to justify high Stat-mux costs because it was only required at the headend where the investment could be spread over multiple hubs and large sub counts.
  - Quality was important when serving larger sub counts and highly viewed content

New breakthrough technology now enables high quality VBR for edge applications

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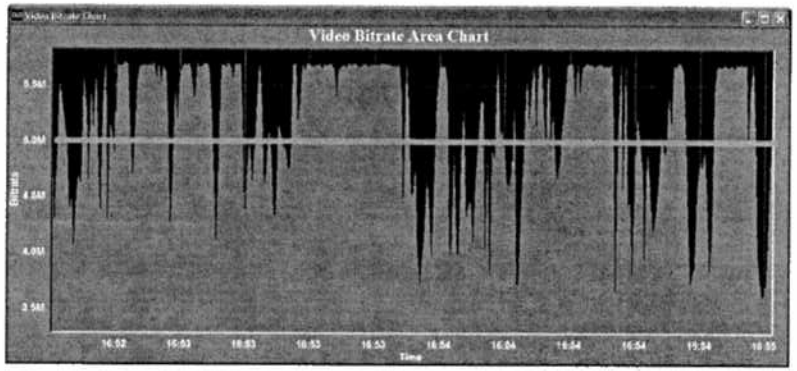
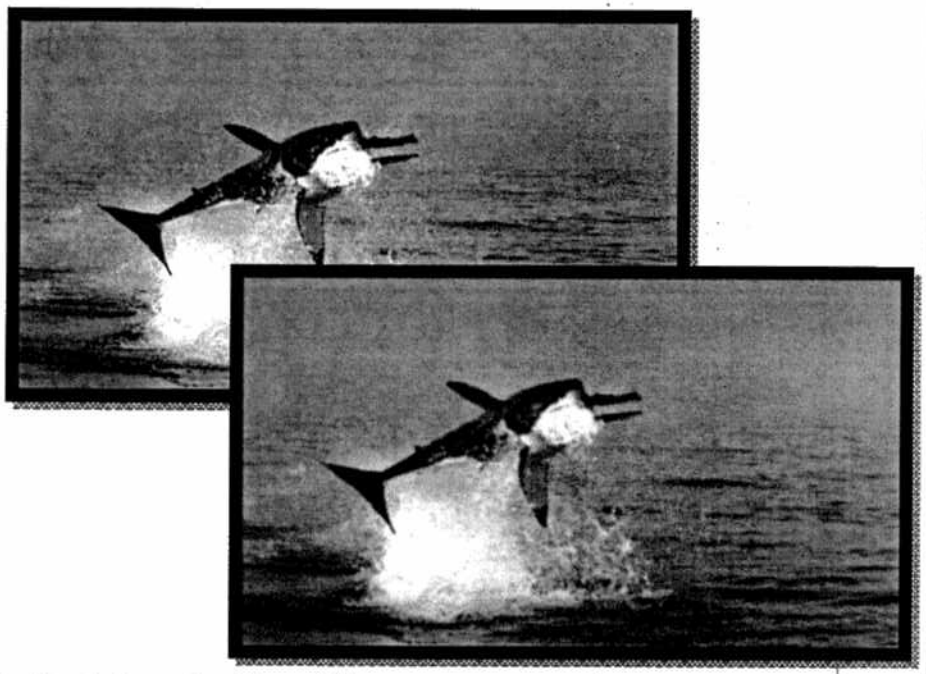
Traditional Constant Bit Rate stream clamping and re-encoding limitations

- **One size fits all regardless of content complexity**
  - High motion sports and talking heads get the same BW allocation
  - Heavy bit rate reduction of complex content peaks can be very noticeable



- **To reduce bitrates, re-encoding uses high frequency filters and recalculates motion vectors that can drive large GOP structure changes**
  - Filtering can add noticeable softness or very slight blurring to the final picture
  - Re-encoding can compound errors and artifacts in the original encoded stream



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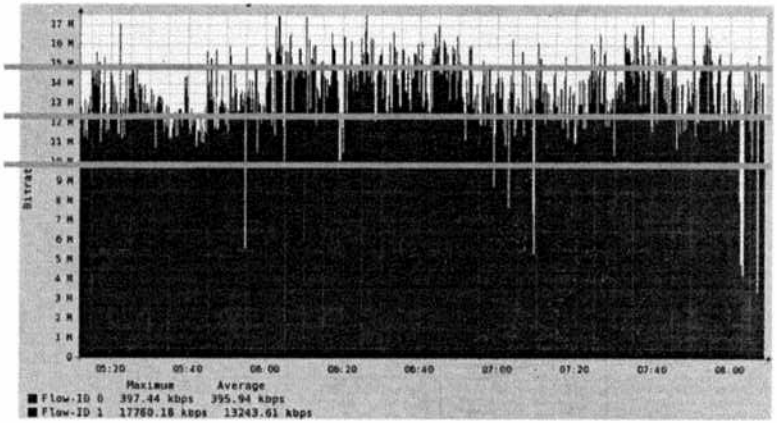
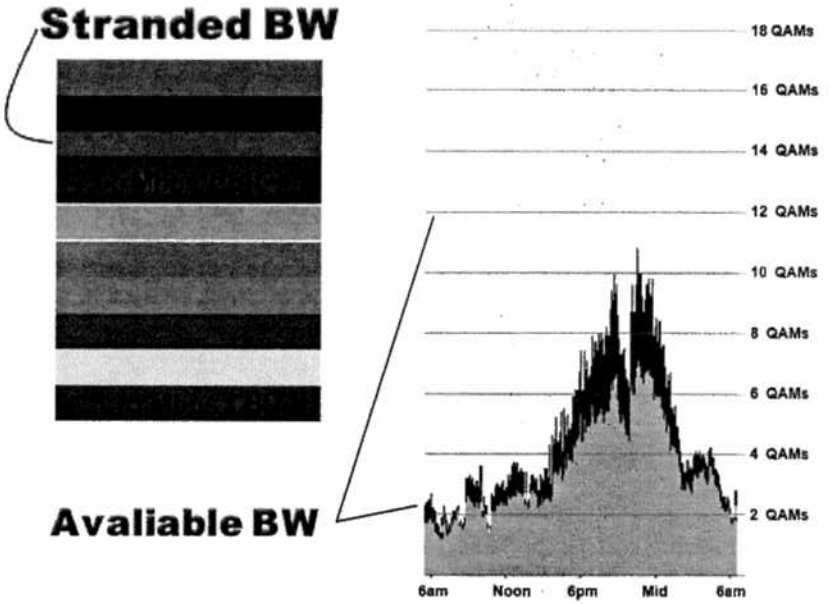
Helps with Quantity but hurts Quality

Multi-rate Constant Bit Rate stream clamping and re-encoding limitations

- Creating a 2nd or 3rd stream of the same content clamped at higher bit rates does improve complex stream quality but sacrifices efficiency
- Multiple stream sizes can increase stranded stale stream BW in a QAM
  - QAM Defragging this condition adds complexity to the Session Resource Manager and can never fully optimize QAM BW efficiency.
- Very hard to pick the ideal BW settings since most programmers content complexity varies throughout the day.
- Higher bit rate CBR streams can be used during times when Service Group capacity is not fully utilized.
  - However, this technique adds risk with having to switch or down grade live streams when SG traffic demand returns during peak busy hours causing noticeable stream impairments





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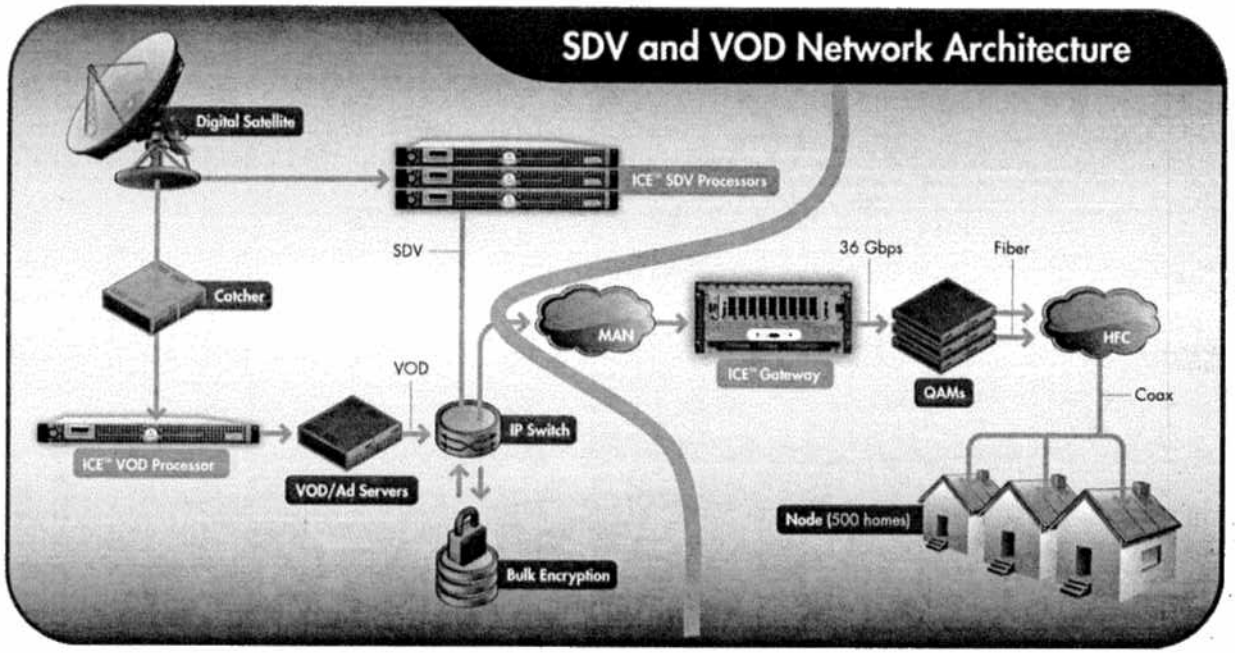
Helps with Quality but hurts efficiency

Imagines' Core Technology

- Breakthrough, unique digital video processing technology with broad applicability
- Technology differentiation
  - ICE-Q™- Industry's first accurate objective video quality measurement system
    - Transposes human visual perceptual system into mathematical measurement algorithms
  - Separating of video processing and multiplexing
    - Re quantization and compression algorithms are based on ICE-Q measurements and is used to build **I**nterchangeable **C**ompressed **E**lements or ICE™
    - PAC™ (**P**ersonalized **A**daptive **C**oding and multiplexing)
    - Video coding can be centralized on the National or Regional Master Headend level with multiplexing at the edge.

Advantages of separating Processing and Multiplexing

ICE Q and ICE video processing is 98% of the workload and done in the core



Statistical Multiplexing is 2% of the workload and done at the network edge

Superior video quality at the lowest cost

Negligible incremental consumer delay

High edge mux density with thousands of streams per RU

Compatible with SDV centralized bulk encryption and pre-encryption

Ideal for future personalized services like addressable advertising & switch unicast

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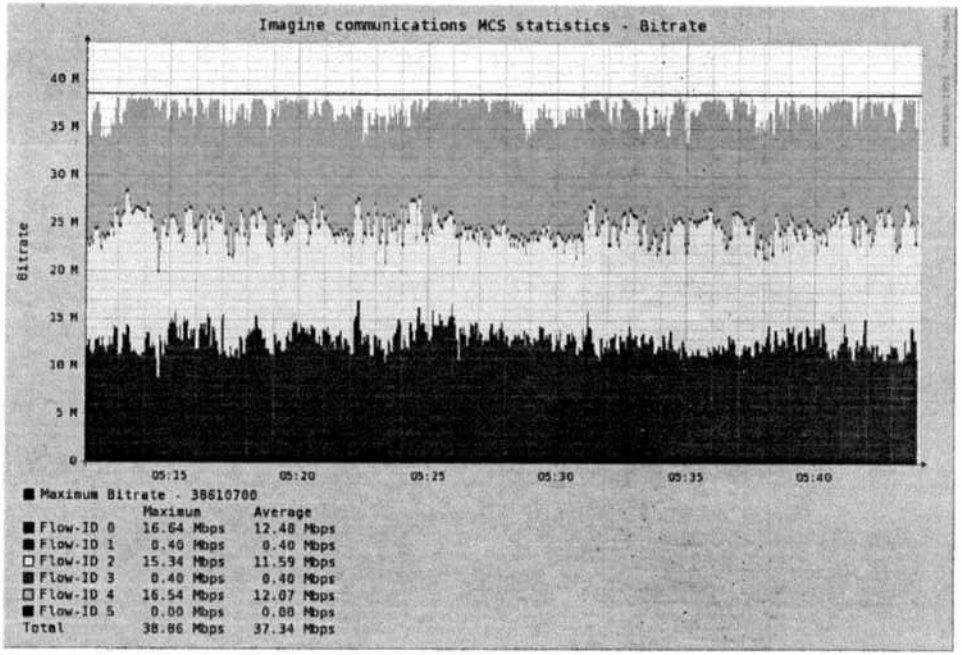
Delivers Video Layer QoS

- Imagines' ICE and ICE-Q technologies gives operators unprecedented control over digital video quality
- Ability to pre-calibrate and maintain consistent video quality across digital video applications
  - Through entire distribution chain (content origination to set-top), and through splicing, multiplexing and encryption stages
- Ability to differentiate video quality between content categories and even individual content assets



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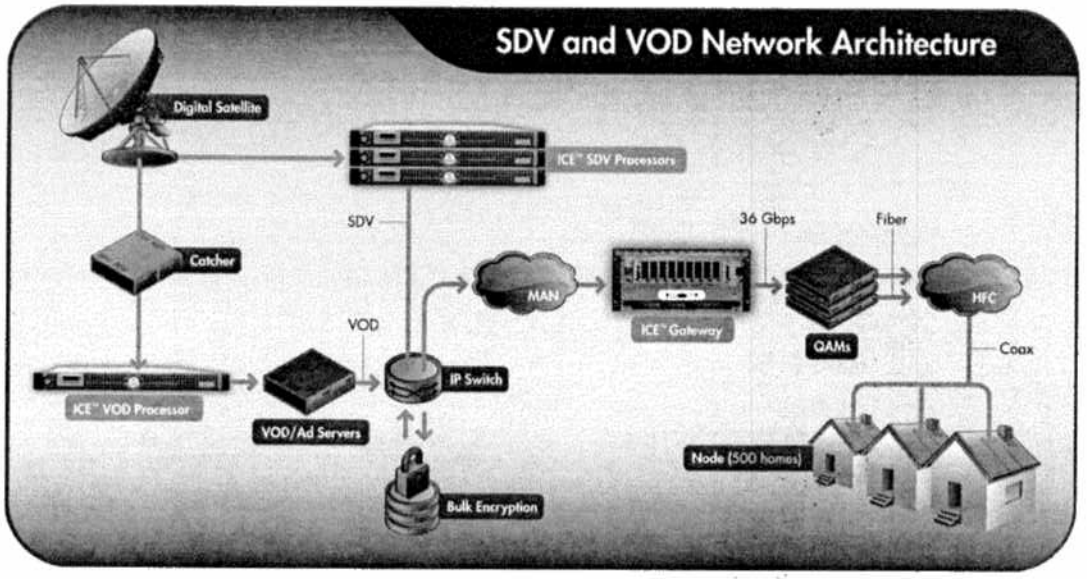
Why ICE Video Processing is Better than Re-Encoding

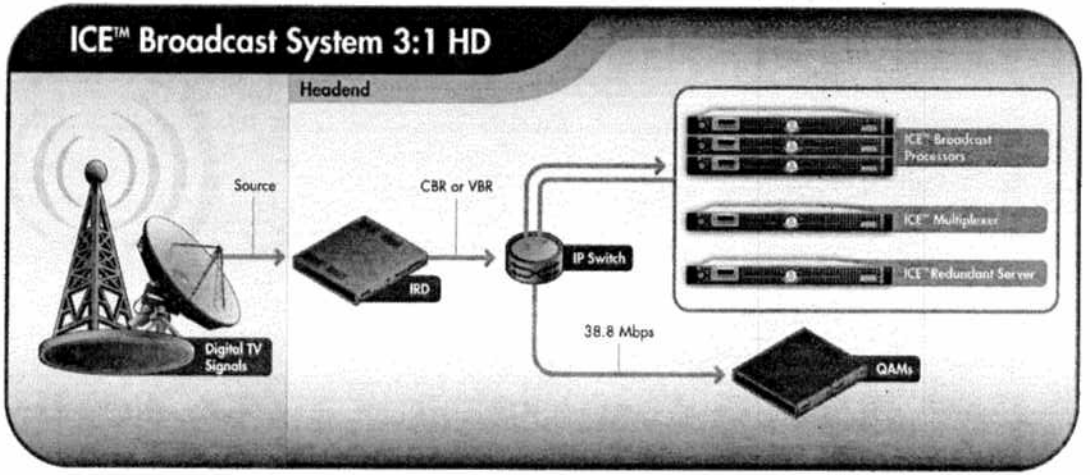
- ICE-Q™ enables precise constant quality VBR encoding rather than brute-force encoding to match the available bit rate
- ICEPAC enables multiplexing by quality rather than multiplexing by bit rate, allowing Video Layer QoS
- We don't filter high-frequency pixels
  - No irreversible "pre-processing" video degradation
- We maintain integrity of source encoder's motion vectors and GOP structure
  - No motion-related degradation and no impact to Start Over/nPVR trick modes or ad insertion
- Edge VBR eliminates stale stream QAM Fragmentation
- 15:1 SD Equivalent streams per QAM allows more time of day streaming and longer stream reclamation intervals.

IMAGINE ICE™ Technology Optimizes Narrowcast and Broadcast Applications

- Enables cost effective edge VBR for highest video quality and 50% more streams per QAM
- Save 33-50% EdgeQAM CapEx on SDV and VOD capacity expansions
- Saves valuable 6Mhz slots needed per service group



- Broadcast QAMs are still ideal for the most popular content. The same ICE technology can be applied to deliver the best broadcast video quality at 3:1 HD & 15:1 SD (per 256 QAM channel)



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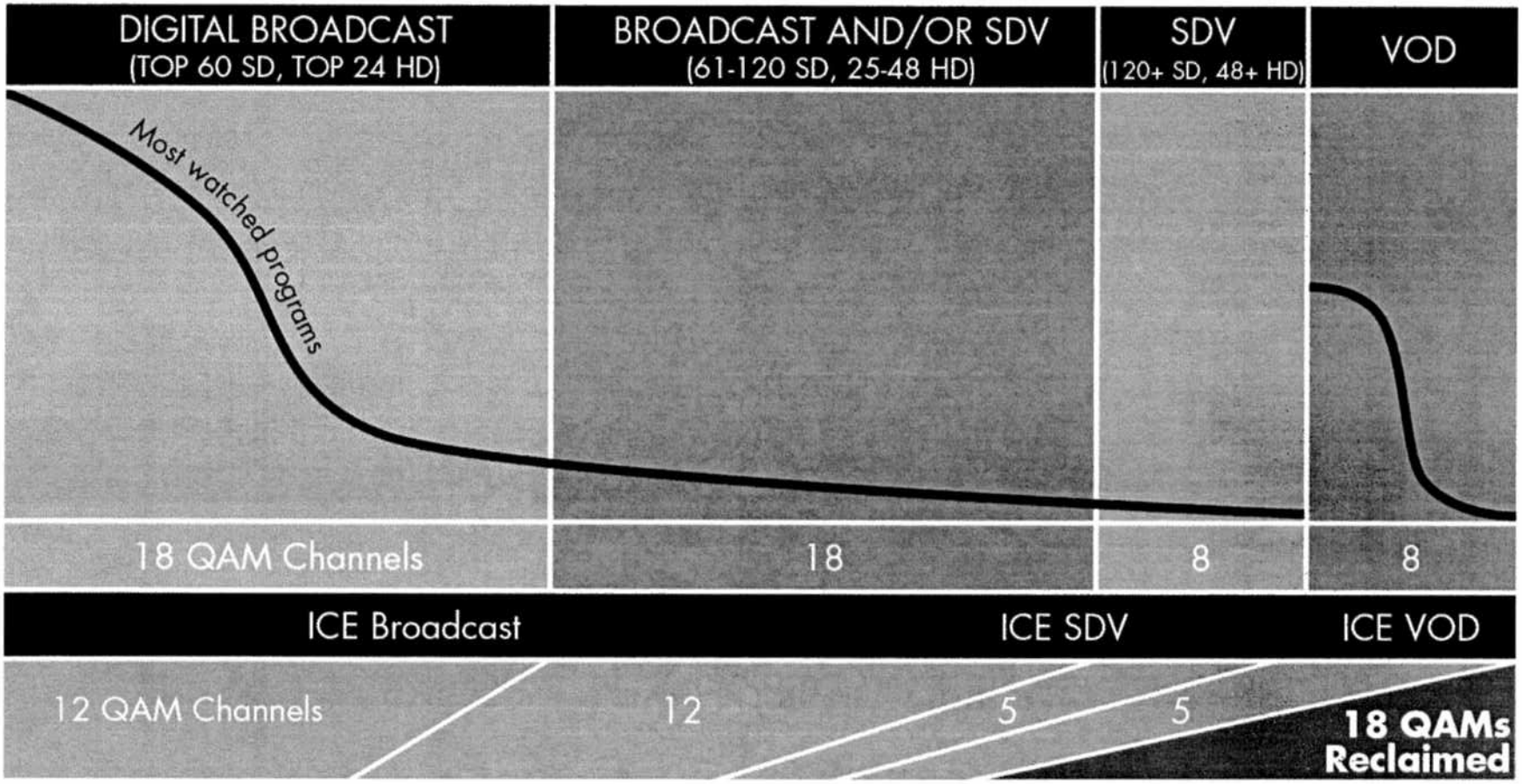
Delivering Spectral Efficiency
Optimal blend of Broadcast and Narrowcast VBR



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In Summary

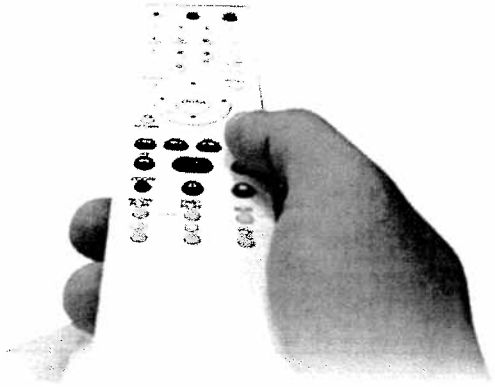
- Up to 50% more streams per QAM at same quality
  - 3 HD-VOD streams per QAM vs. 2
  - 15 SD-VOD streams per QAM vs. 10
  - 15 Standard Definition SDV streams per QAM
- Better Video Quality and Video QoS
- Save 33-50% of incremental EdgeQAM CapEx and use less power and rack space
- Most importantly, save precious 6 MHz spectrum slots for the HDTV bandwidth explosion without sacrificing quality

Quantity and Quality

You can have it ALL with Imagine ICE Technology

Why settle for less?

EXHIBIT 12



Looking Forward

Subsequent software releases will apply Imagine's core technology to Ad Insertion, Network PVR, Personalized Audio and IPTV, while adding various new features personalized to the individual subscriber. Contact Imagine Communications today and learn how you can attack and conquer the HDTV bandwidth challenge with our powerful QOD Product Suite.

About Imagine Communications

Imagine Communications has launched the industry's most powerful and scalable digital video platform, enabling system operators to cost-effectively increase bandwidth efficiency and video quality. The Quality On Demand Product Suite (QOD Product Suite), incorporates breakthrough next-generation variable bit rate and statistical multiplexing technology (VBR/StatMux), enabling up to 50% more streams per QAM versus today's Constant Bit Rate (CBR) approach. Imagine's state-of-the-art ICE-Q™ video quality measurement algorithms enable better video quality at any given bit rate.

Imagine is based in San Diego with R&D and engineering in Israel. Its strong management team includes industry leaders with decades of experience delivering innovations in video communications. Founded in 2005, Imagine Communications is privately held and funded by Carmel Ventures and Columbia Capital. For more information, visit **www.imaginecommunications.com.**

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imagine a technology

so powerful it can increase your bandwidth efficiency AND improve video quality.

Imagine Communications has developed a cost-effective solution that enables delivery of 50% more VOD, Switched Digital Video (SDV) and digital broadcast streams per QAM channel. That's the promise of our new Quality On Demand Product Suite (QOD Product Suite) for broadband operators.

The Simultaneous Rise of HDTV and Sophisticated Viewers

VOD, PVRs, iPods, and the Internet are shifting control of media access to the consumer. Longstanding paradigms such as broadcast delivery, scheduled viewing and fixed location are rapidly giving way to on-demand, personalization and mobility. Media access, anytime and anywhere, is the clarion call of the modern consumer.

At Imagine Communications, we understand that this march toward greater consumer flexibility imposes new costs and complexities on network operators. With the impending mass market adoption of HDTV and VOD, it is crucial for operators to cost-effectively maximize the bandwidth efficiency of their networks.

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Imagine's QOD Product Suite

To attract and retain subscribers, service providers must deliver superior quality and performance. That's why our QOD Product Suite provides operators with proven innovative technology to address this shift in consumer viewing expectations. Comprising a series of products enabling exceptional bandwidth efficiency and enhanced video quality for VOD, SDV, and digital broadcast, the QOD Product Suite helps you compete with other operators looking to capture premium subscribers.

Imagine's VOD system leverages next-generation Variable Bit Rate and Statistical Multiplexing (VBR/StatMux) technology to supercharge operators' VOD expansion with up to 50% more streams per QAM.

"The QOD Product Suite contains solutions for both VOD and SDV, and also encompasses the Post Encoder for digital broadcast applications."

The VOD System includes the VOD Processor and the QOD Gateway:

VOD System

- Three (3) HD-VOD VBR streams can occupy a 256 QAM channel at equivalent quality to today's maximum of two (2) HD-VOD CBR streams
- Fifteen (15) SD-VOD VBR streams can share a 256 QAM channel versus today's maximum of ten (10) CBR SD-VOD streams
- Supports pre-encryption and session-based encryption

VOD Processor

- Incorporates Imagine's revolutionary video pre-processing software on a carrier-grade, off-the-shelf server
- Works in conjunction with the QOD Gateway

QOD Gateway

- Integrates Imagine's StatMux software on a carrier-grade, off-the-shelf MicroTCA platform, available from multiple hardware suppliers
- Total throughput in the 5RU configuration is 36 Gbps, equivalent to 13,000 SD or 3,000 HD streams

Imagine's modular SDV System comprises the SDV Staging Processor and the QOD Gateway:

SDV System

- Maintains the video quality integrity of the incoming digital broadcast signal
- Increases bandwidth efficiency by up to 50%
- Supports centralized bulk encryption

SDV Staging Processor

- Can be used on a standalone basis (i.e., without the QOD Gateway), giving better video quality than current clamping devices
- Incorporates Imagine's ICE-Q™ video quality measurement subsystem, ensuring the best video quality at any given bit rate
- Multi-rate CBR capability ensures consistent video quality across the span of channels in the SDV tier

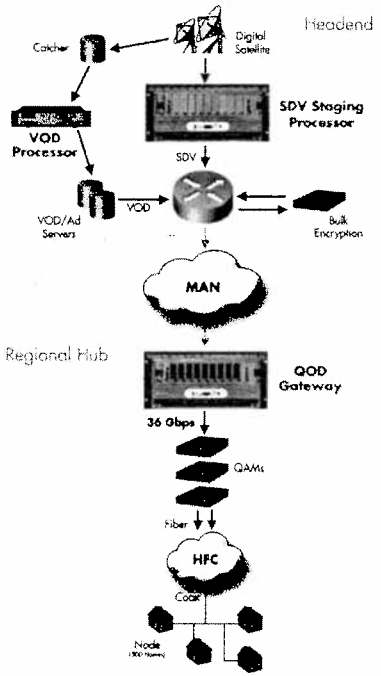
QOD Gateway

- With the addition of the QOD Gateway, operators can statistically multiplex up to fifteen (15) standard definition SDV signals per QAM channel
- SDV and VOD signals can be multiplexed through the same QOD Gateway

How it Works

The QOD Product Suite employs industry-standard open interfaces and plugs seamlessly into existing infrastructure, allowing interoperability with multiple VOD servers, Session Resource Management (SRM) systems, and Edge QAM devices. Imagine-processed VOD and SDV signals can be multiplexed through a common QOD Gateway hardware platform which supports optimized Edge QAM sharing.

Converged VOD and SDV Network Architecture



Imagine's pre-processing functions (VOD Processor and SDV Staging Processor) and the statistical multiplexing function (QOD Gateway) plug seamlessly into existing cable infrastructure.

Spectrum of Services

VOD > HD-VOD > Broadcast > SDV > Ad Insertion > nPVR > IPTV

Benefits of Imagine's QOD Product Suite

VBR/StatMux for VOD, SDV and digital broadcast

QOD Gateway:
50% more streams/QAM

- HDTV: 3 VBR vs. 2 CBR (same quality)
- SDTV: 15 VBR vs. 10 CBR (same quality)
- SDV: 15 streams at digital broadcast quality

Improved Video Quality

- ICE-Q™ video quality measurement algorithms
- SDV Staging Processor provides better video quality than current CBR clamping devices
- Post Encoder enables 3 high-quality HDTV broadcast signals per QAM

Software architecture on carrier-grade, off-the-shelf hardware platform

- 36 Gbps throughput in 5RU
  - o 13,000 SD or 3,000 HD streams

Plugs seamlessly into existing infrastructure

- Industry-standard open interfaces support multiple Edge QAMs, SRMs and VOD Servers
- Supports SDV centralized bulk encryption; VOD pre-encryption and session-based encryption

Intuitive and useful management software

- Automatic synchronization and provisioning with existing topology
- Video Quality of Service ("Video QoS")

EXHIBIT 13

FULLY REDACTED